Name: Rebecca Blackwell

Subject: BSc(Hons) Speech Sciences 2007

Year: 4

Predicate Acquisition: Is there an advantage for children learning British Sign Language?

Word Count: 9,382

Project Supervisor: Tyron Woolfe & Bencie Woll

ProQuest LLC
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106-1346

Contents Page

Abstract

This study looked at predicate acquisition in comparison to noun acquisition in children learning BSL and English over a 20 month period using the MacArthur Bates Communicative Development Inventory. The study used 61 children learning BSL (29 deaf children and 32 Children of Deaf Adults) and 548 children learning English. The study found that children learning BSL between 8-17;99 months had significantly more predicates in their productive vocabulary ($p<.005$) than children learning English, however this was not the observable trend for the whole of the research study. It also found that in BSL, predicate vocabulary did not take up a greater proportion of signs in comparison with nouns, which were still consistently the largest grammatical group present in both English and BSL early vocabularies.

The conclusions of this study have been made with extreme caution due to extensive methodological limitations, which were recognised in using and comparing the two different languages.

Literature review

1.1 - Introduction

The aim of this study is to report and discuss early noun and predicate acquisition in British Sign Language (BSL) and English from a longitudinal study using the MacArthur-Bates Communicative Development Inventory (CDI). The main issues addressed in this paper are whether BSL has a similar overall pattern of language development to that of English, and whether there are a greater proportion of predicates in BSL than in English.

The general pattern of language acquisition of sign languages and spoken languages has been reviewed using numerous studies which have studied American Sign Language (ASL) development as well as English as a way to provide a means of comparison between spoken and signed languages. Predicate and noun acquisition will be described with the influence of a cross – linguistic study by Hoiting (2006), which will be discussed in depth later on in this paper. This paper looks to replicate the study by Hoiting and to see if the findings from that, are applicable to BSL.

1.2 - Spoken language development & research

'A language is defined by a finite set of underlying operational principles with rules that have a process of rule usage and therefore a resulting product' (Owen, 2001). The question of how and when children learn these rules and begin to express them is of major theoretical and empirical significance and has been the focus for researchers for many decades. Language development typically is used in the sense of a natural or automatic unfolding of language along a regular path, as indicated by universal milestones relevant to a language (Marschark et al. 2006.)

Studies have used many different methods, from diary studies to parent checklists, all of which have been used to chart the progression of language. Many draw very similar conclusions, for example the age at which words first emerge is indicated at around 12-14 months (Nelson, 1973; Benedict, 1979; Barrett, 1995; Paul, 2001). Studies have also shown that there are similarities with regards to the categories and the kind of words acquired (Table 1.1)

Vocal babbling, which often produced around four months, often marks the beginning of a hearing child's path of the emergence of language. Babbling is defined as 'long strings of sounds that' (Owen, 2001). As the child matures, their babbling goes through different developmental stages, until the sounds produced resemble the native phonological properties of their language. The first words produced by children learning have been said to occur around the end of the first year of life (National Institute on Deafness and Other Communication Disorders, NIDCD)

Longitudinal studies have indicated that when children's language first emerges there is an apparent slow and steady growth of words acquired up to one or two newly produced words per week (Bertoncini et al. 2003). However, 'towards the end of the second year, children typically display a sudden spurt in vocabulary growth, roughly after their productive lexicons have reached 50-100 items' (Dapretto & Bjork, 2000). By the age of two children may be able to produce anywhere from 100 – 600 words, after this spurt has begun.

So far only research into the development of spoken languages has been discussed, but what of languages that are signed?

People: daddy, mommy, baby, grandma, grandpa
Food/drink: Banana, juice, cookie, cracker, apple
Body parts: eye, nose, ear
Clothing: shoe, sock, hat
Animals: dog, kitty, bird, cat, fish
Vehicles: car, truck
Toys: ball, book, boat
Household objects: bottle, keys
Routines: bye, hi, no, night-night, bath, thank you
Activities (sound effects, motion, state0: uh oh, woof, moo, ouch, yum, up, down

Table 1.1. Early word production. (Fenson et al. 1994.)

1.3 - Sign Language development & research

Sign language is a visual-spatial medium in which audition and speech mechanisms are not relied upon to communicate. Linguistic information is conveyed using hands, fingers, facial expressions as well as the body. 'Sign language has a unique grammatical structure that is distinct from spoken languages (Stokoe, 1960). Much of the research to date on sign language development has attempted to show how the development of ASL and other sign languages has no difference than that of the development of spoken languages (Marschark et al. 2006). This may be due to the fact that language studies have strived to find commonalities between that of signed and spoken languages and this therefore impacts on how results are interpreted.

Overall studies have found that children who learn sign language e.g. ASL, have a vocabulary that contains similar words to that of children learning spoken languages. There is a similar distribution in terms of vocabulary into grammatical and semantic categories as well as specific lexical entries. Deaf children of hearing adults have also shown that the content of their early vocabulary is broadly similar to typical development however as the child's language matures differences do emerge (Woll, 1998).

In contrast to spoken languages there appears to be no evidence of a vocabulary spurt for children learning sign languages, but rather a gradual and steady increase in their rate of sign acquisition (Bonvillian, 1999). This is supported by the findings shown in Appendix 1, Fig1.8, from the Anderson & Reilly's (2002) study.

There has been some indication that deaf babies also begin to produce words earlier than that of hearing children. Some research has claimed that deaf children produce

their first meaningful signs as early as 8 months (Anderson & Reilly, 2002; Bonvillian & Folven, 1987; Conlin et al. 2000). There has been some disagreement however as to whether children are communicating with intent or are displaying manual babbling. Pettito & Marentette (1991) indicated that during the latter stages of the first year of a deaf baby's life manual babbling is observed. This is the same as the vocal babbling that hearing children are observed to do around this stage of development, between 10-13 months (de Villiers & de Villiers, 1978), before the emergence of their first word. Therefore this manual babbling appears to be a natural part of the process which deaf children display before the first recognisable signs are produced. Anderson & Reilly (2002) argue that deaf children are given credit for producing meaningful communication, whereas with hearing children are not.

Before the CDI was adapted to assess sign language, much of the information about early sign language acquisition had come from two longitudinal studies: Bonvillian, Orlansky & Novack, (1983); Folven & Bonvillian, (1991).

Bonvillian, Orlansky & Novack, (1983) studied 11 young CODA's sign language and motor development over a period of 16 months. The study found that these children produced their first recognisable signs around 8.5 months, whereas their hearing counterparts produced their first words 2-3 months after this period. They also found that the content of the first 50 signs learnt were similar to that of children learning spoken languages.

Folven & Bonvillian, (1991) used parental diary reports and home visits to study the language acquisition of 9 children of deaf parents. They also found that first recognisable signs emerged at around 8.2 months and that children had 10 recognisable signs by the age of 13.5 months.

Children of Deaf Adults (CODA's) language acquisition has been studied by researchers and they have found that these bilingual children in early language production demonstrate code-blending (Baker & van den Bogaerde, 2006). Code blending is where the spoken and signed language is combined simultaneously. Milroy & Muysken (1995) believed that this showed that CODA's had high levels of language ability and language acquisition rather than the assumed language incompetencies. A longitudinal study by Prinz & Prinz (1979) describes the linguistic development in ASL and spoken English by a hearing female child whose mother was profoundly deaf and father was hearing. They found that (1) the child's first sign emerges several months before the first spoken word, (2) lexical acquisition in ASL

and spoken English progresses through similar stages, and (3) the child initially develops one lexical system, with separate entries from both languages.

Therefore in conclusion, the research in language acquisition indicates that if both deaf and hearing children are exposed to language input from birth, there is an overall identical maturational time course between signed and spoken languages (Pettito, 2000).

However, these overall conclusions that are mentioned in reference to research into signed languages have been met with criticism from some researchers. Some feel that the complexity of sign language learning environment has been ignored and that the vast variability of sign language has been missed. There are also other methodological issues around these early studies of sign language acquisition including using extremely small sample sizes, which make generalisation of the findings difficult (Anderson & Reilly, 2002). One of the key factors as well with early studies into sign languages is that the hearing status of the parents was not taken into account. This impacts on the age at which children are exposed to sign languages, which in turn impacts on age and rate of acquisition

1.4 - The MacArthur Bates Communicative Development Inventory

One of the most recent developments in research into child language development both spoken and signed, has been the development of the CDI. The CDI is a standardised parental report tool that has been used to study vocabulary development. It is a checklist of vocabulary that can be used by parents to indicate the words their child uses. It is standardized for children between the ages of 8-30 months (Fenson et al. 1994).

It was originally designed to research English language development; however due to its high validity, reliability and the ease in which it can be administered, it has since been developed for many other spoken languages i.e. Spanish (Thal et al. 1993) Italian (Caselli et al.1995) and Japanese (Ogura et al. 1993) to name but a few.

It has also recently been adapted to assess ASL development (Anderson & Reilly, 2002). The CDI seeks to provide researchers with a more reliable and valid tool for researching children's early sign language acquisition, than previous language assessments.

The items in the ASL CDI were adapted from the spoken languages to make it more applicable to that of signed languages i.e. some categories such as 'animal sounds'

were removed. Words that had an identical sign form, but were of different grammatical function e.g. eat vs. food were placed into one category as the verb form. Pilot study results also meant that signs used by less than 10% of the population were omitted from the study. The pilot also showed that categories such as 'Body Parts' were not appropriate as they did not have a formal sign but were rather indicated via pointing. A summary of the findings of this study can be found in Appendix 1.

What is interesting about the study and has gone on to be further debated and researched and is also the focus of this paper, is the difference found between noun and predicate acquisition in deaf and hearing children. A verb or simple predicate is defined as the word or words that express action or say something about the condition of the subject (See Fig 1.2 for an example). A predicate must contain a verb and the verb requires permits or precludes other sentence elements to complete the predicate.

Highlighted words denote the subject. {} mark the predicate

Paul {walks}

Judy and her dog {run on the beach every morning}

Fig 1.2: Examples of predicates in sentences

Nouns, in both populations, appears to take up the greatest proportion of vocabulary when the lexicon size is around 200 words; however this gradually decreases as the number of items in the vocabulary increases (Anderson & Reilly, 2002).

Predicates, however in the study conducted by Anderson & Reilly (2002) highlighted a slow steady growth over time. Predicates in their study were defined as the sum of three categories from the ASL CDI: Action signs, Helping Verbs, and Descriptive Signs. Deaf children appeared to have a greater number of predicates present in their early lexicon compared with that of hearing children (see Table 1.3).

English	English	ASL
0-50	.07	.17
51-100	.10	.22
101-200	.14	.23
201-300	.17	.30
301-400	.21	.33
400+	.24	.33

Table 1.3: Anderson & Reilly, (2002) - A Comparison of proportion of predicates (English Data extracted from Bates et al, 1994)

There is some debate amongst researchers over whether or not early language development centralises the use of verbs. A study conducted by Gentner (1982) indicated that there maybe an early noun dominance present in spoken languages. The study indicated that the word order of a language may play an important factor in early language acquisition. In contrast to finding noun dominance in early language acquisition for all spoken languages, the study indicated that languages, such as Tzeltal, have a rapid verb growth due to the structure of the language. It was argued that if a verb is in a more salient position to that of the noun, the child will hear this as the first or only element of the sentence and therefore it is acquired sooner than that of nouns.

In contrast, one view is that it may be due to the fact that the typology of sign language differs from that of spoken languages (Slobin, 2006).

1.5 - Typology of languages: Spoken and Signed

The English language has a rigid word order of Subject-Verb-Object (SVO), whereas sign languages such as ASL do not. Due to the nature of sign language, information is not only conveyed by the sign form itself but also by specific positioning and body language which help to topicalize an object. This means that the word order in ASL is less rigid to that of spoken languages such as English. Often, in ASL, as single verb is signed, the verb's movement defines the subject and the object.

Sign language, such as ASL and BSL, is referred to in some literature as a 'head-marked' language (Slobin, 2006; Hoiting & Slobin, 2003). Nichols (1986) defined the 'head' as "The word which governs or is subcategorized for – or otherwise determines the possibility of occurrence of – the other word. It determines the category of its phrase". In these languages verbs 'head' the construct. Sign languages are not the

only languages to be viewed as head-marked languages, spoken languages such as Mayan languages, languages from the Americans i.e. Blackfoot, Cree and Nootka (Hoiting, 2006). With these languages all of the essential syntactic information is within the verb.

Acquisition of verbs in languages, such as English, may also be slower, due their abstract nature and the need for decontextualisation which does not occur in some languages such as Tzeltal (Brown, 1998) where the verb is richer in semantic information. In English, there are general verbs such as 'eat', however in languages such as Tzeltal, there are several 'eat' verbs, which are used according to what is being eaten. This indicates that the verbs are a richer source of information.

This essential typological characteristic of sign language means that deaf children pay more attention to signed verbs when acquiring a language as nouns are less salient and frequent than that of some spoken languages. Verbs that are signed are rich with information and serve as the main carrier of information for deaf children. The findings of these studies may indicate that 'early language development may come to reflect the typological characteristics of the exposure language' (Slobin, 2006).

1.6 - Netherlands Sign Language Study

As previously mentioned, an influential study for this paper was conducted by Hoiting (2006) who described deaf children as verb attenders, with reference to the early sign vocabulary development in Dutch toddlers. (See Table 1.4 for the research sample for the study.) This investigated children's sign acquisition to see if the trend for differentiation between noun and a predicate acquisition was true for Sign Language of the Netherlands (SLN).

Language	Parents	Age Range	Number of Children
SLN	Deaf	1;3-3;0	4
SLN	Hearing	1;4-3;0	13
SSD	Hearing	1;5-3;0	13

Table 1.4: Research Sample for Hoiting (2006)

As part of the study Hoiting explored the similarities between children learning SLN but with the hearing status as a variable: hearing vs. Deaf parents. She also looked at the kind of language input (SLN vs. Sign Supported Dutch (SSD)) received.

SSD was characterised by Hoiting, as being 'a flexible system that follows Dutch word order, and a borrowed SLN lexicon, primarily adding finger spelling for Dutch grammatical elements and proper names'. SSD was described as a hybrid sign system which may constitute as an 'impoverished input'.

Hoiting also explored in the potential impact of the language environment that the child is brought up in, on overall language acquisition. She discussed the notion that hearing parents, who use SLN with their deaf children, are by definition late sign language users because they are hearing (Anderson & Reilly, 2002). This raised an issue around the quality of the language input as it has been suggested by some researchers that deaf children of hearing parents have 'impoverished language exposure' compared with deaf children born to native SLN users. However studies have shown that children learning SLN from hearing parents did not have as greater language delay compared with children learning SSD from hearing parents. For Hoiting's study an adapted version of the CDI was used. The study differs from that of Anderson & Reilly's (2002) paper by the method in which the CDI was administered. Hoiting conducted the SLN-CDI via personal contact. Parental interviews were conducted in order to gain further insight into each child's language abilities. The data collected was compared with English data collected from a study presented by Bates et al. (1994).

Predicates, in Hoiting's study, were the total of verbs and adjectives produced. Hoiting was able to group these together because the data collection method meant that she was able to analyse sign production and acquisition in the context of a sentence. It was not appropriate to call a verb or an adjective which is signed in isolation a predicate, as predicates are only found in a sentence structure.

1.7 - Summary of Netherlands Study:

Hoiting's analysis indicated that, overall, there was no significant difference between children who are learning SLN with Deaf or hearing parents (Fig. 1.5). Language acquisition appears to progresses along the expected trend, regardless of the hearing status of the parents, and perceived 'impoverished language input'. Hoiting also looked at percentage of predicates in children learning sign language, regardless of the hearing status of the parents, and with no differentiation between SLN and SSD, and compared this with the data from Bates et al's. (1994) study.

Comparison between Sign language and English (Fig 1.6), highlighted that children learning sign had a larger percentage of predicates in their overall vocabulary compared with children learning English.

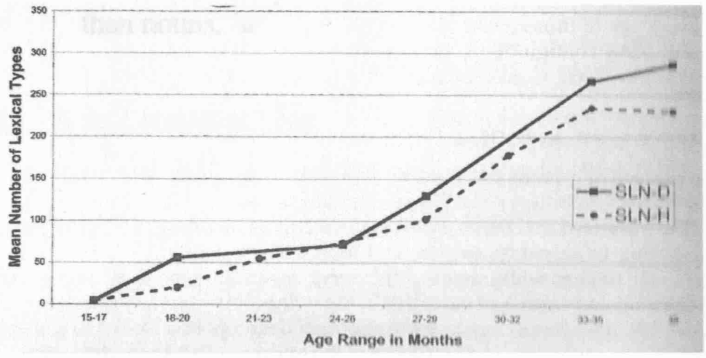


Fig 1.5: mean number of lexical types for children learning SLN with Deaf or Hearing parents.

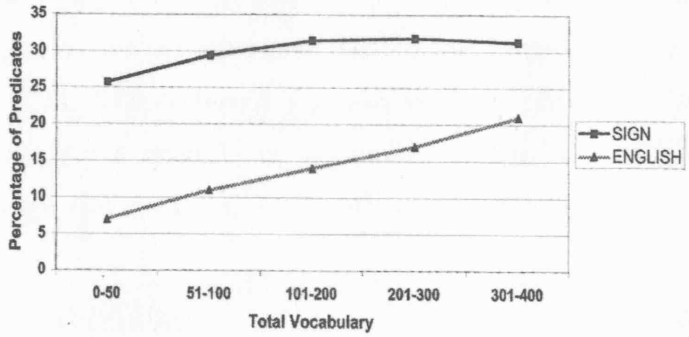


Fig 1.6: percentage of predicates in total vocabulary for English and Sign

This cross-linguistic study supports the findings of previous studies which have compared signed and spoken languages, that deaf children do have a similar vocabulary growth overall to that of hearing children, as well as having a significantly greater proportion of predicates in their early vocabulary.

1.8 – Implications, expectations & hypotheses for this study

The studies such as Hoiting (2006) and the ASL CDI have shown to have similar patterns of predicate development for sign and spoken languages, but what of BSL? Are the same trends observed for this language group?

From reading the current literature and basing this study around the above mention Netherlands study, the hypotheses for this study are as follows:

- Children learning BSL (deaf children and CODA's) will produce more predicates in their early language acquisition compared with children learning English.
- Deaf children and CODA's will have more predicates in their early vocabulary than nouns.

Methodology

Due to the longitudinal nature of children's language development, it was not possible in the time was used.

2.1 - Sign Language Data

The data for BSL acquisition was gathered from an on-going study run by the Deafness, Cognition and Language (DCAL) centre in London. The data was collected from the BSL version of the CDI (See Appendix 2). This version has been adapted from the ASL version. The BSL CDI was modified so that it was suitable and relevant to the population that it was testing e.g. some American vocabulary was removed from the forms i.e. sledge. The data for standardization of this test was also sent to each family every three months for them to chart the development of their child's language development because of the small population size.

The BSL CDI collected information about BSL development of deaf children and CODA's and through out this study, this data will be referred to as the 'BSL CDI' through - out the paper, unless otherwise indicated.

2.2 - English Data

For the development of English in hearing children, data has been used from the Oxford CDI (Hamilton et al. 2000). This is similar to the CDI and is a parent report tool (see Appendix 3) looking at assessing children's receptive and expressive language. Their research looked at the language development of children between the ages of 8 – 28;99 months. Data for hearing children will be referred to as 'Oxford CDI' through-out the paper, unless otherwise indicated.

2.3 - Participants

For the purpose of this study, only children who were tested between the ages of 8 – 28;99 months were included in this study (see Table 2.1 for sample size). This was to allow the data overall to be more comparable. The BSL CDI data (Table 2.6 in appendix 4) originally had data sets for children up to the age of 37;99 months.

Group	Language	Hearing Status	Age range	No of children	No of data sets
Deaf	BSL	Deaf	8;0-28;99	29	100
CODA	BSL	Hearing	8;0-28;99	32	117
Hearing	English	Hearing	8;0-28;99	548	548

Table 2.1. Research sample

As highlighted, in the review of Hoiting's (2006) study, it is not appropriate to call a verb a predicate in isolation, out of context from a sentence, as a predicate may be a verb or an adjective. Therefore for this study, predicates are defined as the sum total of: Helping Verbs, Action Words and Descriptive Words from the BSL CDI.

2.4 - Modifications to the data

To make the data comparable, the following modifications were made to data sets from the Oxford CDI and the BSL CDI:

1) The Oxford CDI data was transferred into the same computer programme (SPSS) as the BSL CDI data. Conversion of the smaller data was easier and more simplistic to match onto SPSS, than trying to convert the BSL CDI.
2) The overall scoring and lay-out of the Oxford CDI data was different to that of the BSL CDI. On the Oxford CDI, scores were presented as 0, 1 or 2 and presented in one column. The scores represented: 0 - the child did not understand or produce the word. 1 - The child understands the word. 2 - The child understands and produces the target word, see example in Table 2.2.

	Apple	Banana
Child 1	2	1
Child 2	0	2

Table.2.2: Example of input data in the Oxford CDI database

3) In the BSL CDI database however, comprehension (comp) and production (prod) were presented in two separate columns and scored as either: 0 – the child does not produce or understand the word or 1 – the child either produces the word or understands the word. Table 2.3 shows how this is demonstrated in the BSL CDI.

	sink(prod)	sink(comp)	Stairs (prod)	Stairs (comp)
Child 1	0	1	0	0
Child 2	0	1	1	1

Table.2.3: Example of input data from the BSL CDI database

4) To make the Oxford CDI data comparable to that of the BSL CDI data there needed to be a score for both production and a score for comprehension. To create uniformity between the Oxford CDI and the BSL CDI, all scores of '2' were converted to show [1] for production and [1] for comprehension in the BSL CDI. All scores of 1 were converted to indicate [1] for comprehension and [0] for production. Scores of 0 were represented as [0], [0] on the amended CDI. The data shown in Table 2.4 represents data from Table 2.2 which has been converted using the guidelines outlined above.

	Apple (prod)	Apple (comp)	Banana	Banana
Child 1	1	1	0	1
Child 2	0	0	1	1

Table 2.4: Example of converted data from the Oxford CDI

5) During the conversion of the data, categories which were only found in one of the sets of data, were removed e.g. 'animal sounds'. This category was removed from the Oxford CDI, as this was the only one not transferable to the BSL CDI.
6) Words which were similar in nature in both CDI's e.g. 'rock' (Oxford CDI) and 'stone' (BSL CDI) were treated as the same item. The implications of this meant that when the scores from the Oxford were converted and transferred to the BSL CDI database, the scores for 'rock' were placed under the BSL CDI heading of 'stone'. This again was to ensure that the data was comparable.
7) Some words in the original BSL CDI data were grouped together e.g. he/she/it. However, in the Oxford CDI data they were organised as separate items. To make comparison easier, the average score was calculated from the BSL CDI data for the total score of the group of items. Once calculated these

were then placed into separate headings to match the scores of the Oxford database. (See Table 2.4 & 2.5 for examples).

Category Item	Prod	Comp
He/she/it	1	1

Table 2.4: Example of data grouped together in the BSL CDI

Category Item	Prod	Comp
He	1	1
She	1	1
It	1	1

Table 2.5: Example of data after averages were taken in the amended CDi.

All this modifications limit the methodology of this study and therefore impact on the ability to interpret the findings with total confidence. These will be explored in further detail in the discussion.

Analysis

3.1 Overall Analysis

An overall analysis was conducted of total production, total comprehension, noun production, noun comprehension, verb production and verb comprehension using One-way Analysis of Variance (ANOVA). For ease of reading, Appendix 5 reports the overall difference in these areas between all three groups. Tables 3.7 – 3.12 give greater detail of this analysis in Appendix 6.

The analysis shows that not all areas had a between group significance. When looking at the group comparison however, all areas under analysis indicated that there was a significant difference between deaf children learning BSL and CODA's development of BSL. Predicate production however, appears to be the only area in which there is no significance between these two groups p .103.

Therefore, this study will analyse all three groups independently of each other unlike the Netherlands study which place children learning SLN, with parents of different hearing status, together.

3.2. Production

Initial observations of Fig. 3.1; indicate an apparent difference in total production between all three groups. The initial trend seems to indicate that all three groups have a similar production until around the age of 17-19 months. There then seems to be a sudden growth spurt in production for children learning English. CODA's production also appears to follow this trend, while deaf children seem to have a steadier and slower rate as they get older. In summary, there seems to be a large difference in the production of deaf children compared with that of CODA and hearing children after 17-19 months of age. A closer inspection of each group's performance at each age interval was carried out using ANOVA, (table 3.7 Appendix 6).

The data indicated, that although there appears to be a difference between all three groups, significant differences start at 20-22.99 months between deaf and hearing children's production. There also seems to be a significant difference between CODA's and hearing children $p < .02$. However this difference between hearing children and CODA's was not repeated for the rest of the analysis.

The data also showed the apparent rapid growth in production of children who were learning English, 14-16.99 months, (Mean no of words – 14.89 (SD - 24.26)) to 20-22.99 months (Mean no of words – 129.2 (SD: 80.7)). This seems to show some support for previous studies which highlight a vocabulary spurt after the first 50 words, which in this study is around 14-16.99 months.

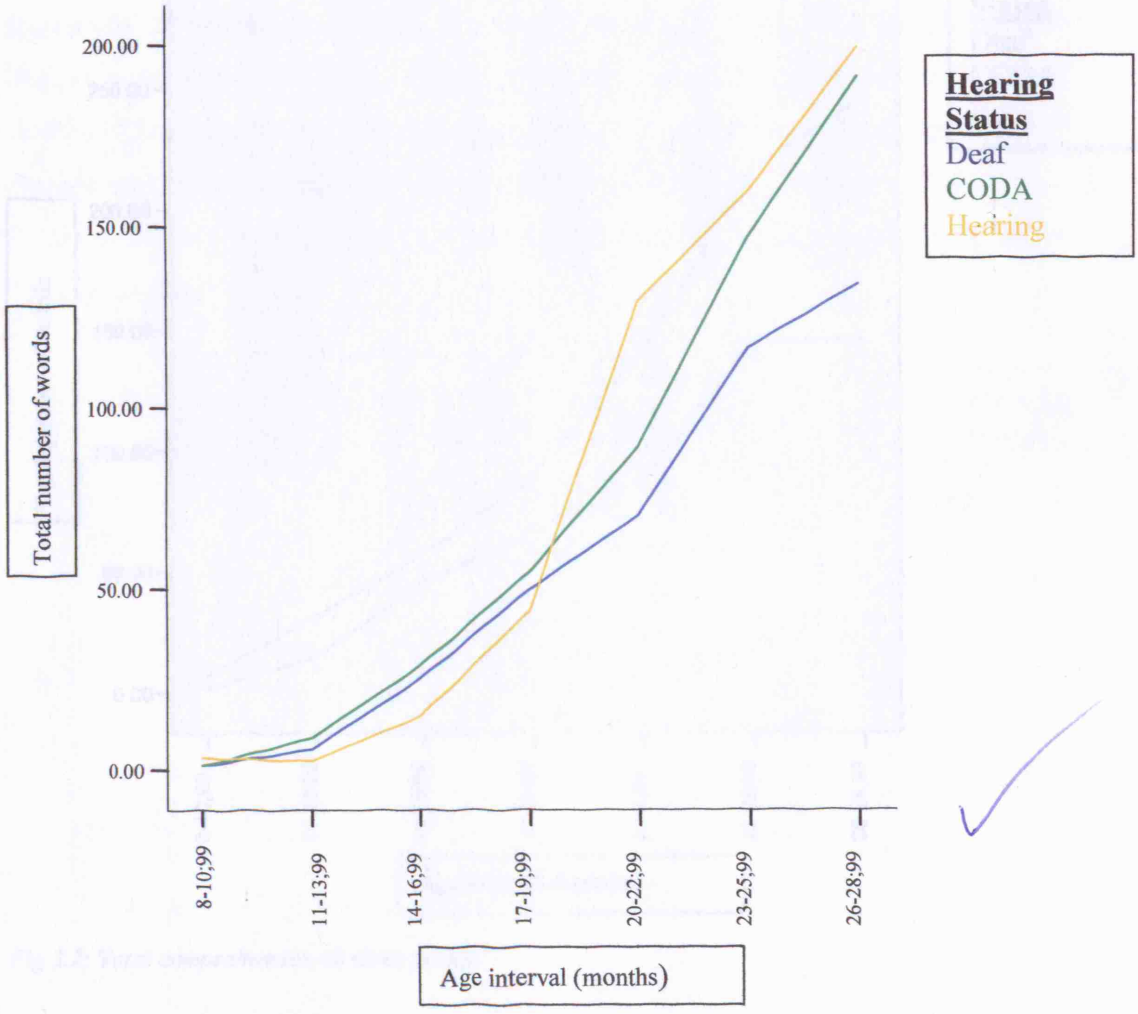


Fig: 3.1: Production for all three groups

3.3 Comprehension

Unlike production, fig 3.2 appears to indicate that comprehension is different in children learning English, to that of children learning BSL from 8 months to 36 months. The overall trend of the graph suggests that children learning English have a larger comprehension vocabulary than that of deaf children learning BSL. CODA's comprehension seems to follow a similar trend and size to that of children learning

English. Both hearing children and CODA's also appear to have a greater number of in their comprehension vocabularies than that of their production vocabulary size at all age intervals. Deaf children on the other hand appear to have a similar size comprehension and production vocabularies at all age intervals.

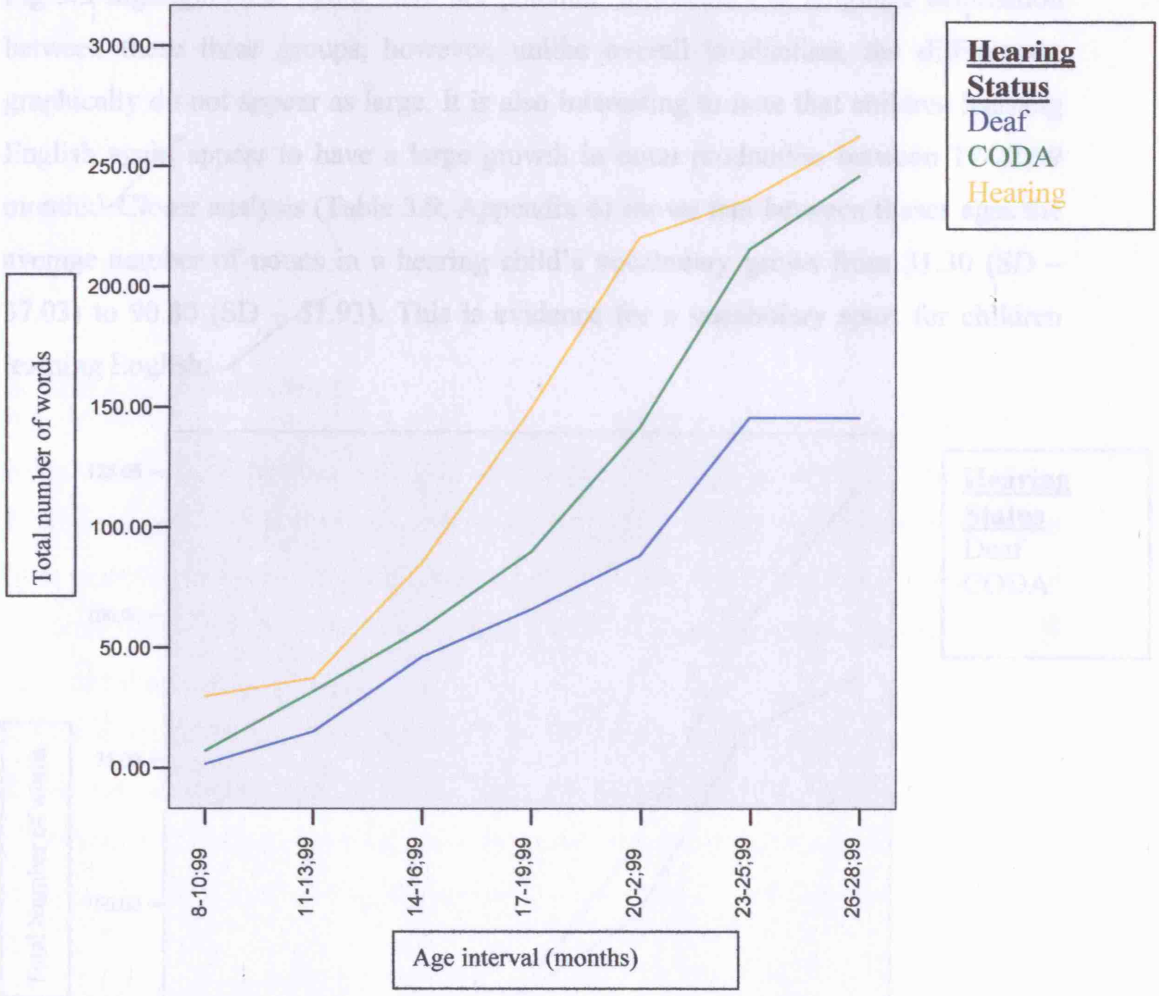


Fig 3.2: Total comprehension all three groups

Closer analysis (see Table 3.8 in Appendix 6) indicates that there is a significant difference between all three groups from 8-10.99 months. Between these ages children learning English were found to be able to comprehend up to 30 words, whereas both groups learning BSL understand less than 10 signs.

However the difference between deaf children and CODA comprehension in BSL was not evident until 23-25.99 months. Around this time hearing children's and CODA's comprehension vocabularies become of a similar size with children learning English

having a mean number of words of 262 (SD - 40.18) and CODA's mean number of word at: 246.06 (SD 52.46). The data overall therefore seems to indicate that at all age intervals hearing children have a significantly larger comprehension vocabulary to that of deaf children.

3.4 Noun Production

Fig 3.3 highlights that again there are potential differences in language acquisition between these three groups, however, unlike overall production, the differences, graphically do not appear as large. It is also interesting to note that children learning English again appear to have a large growth in noun production between 17-22;99 months. Closer analysis (Table 3.9, Appendix 6) shows that between theses ages the average number of nouns in a hearing child's vocabulary grows from 31.30 (SD – 37.03) to 90.80 (SD – 51.93). This is evidence for a vocabulary spurt for children learning English.

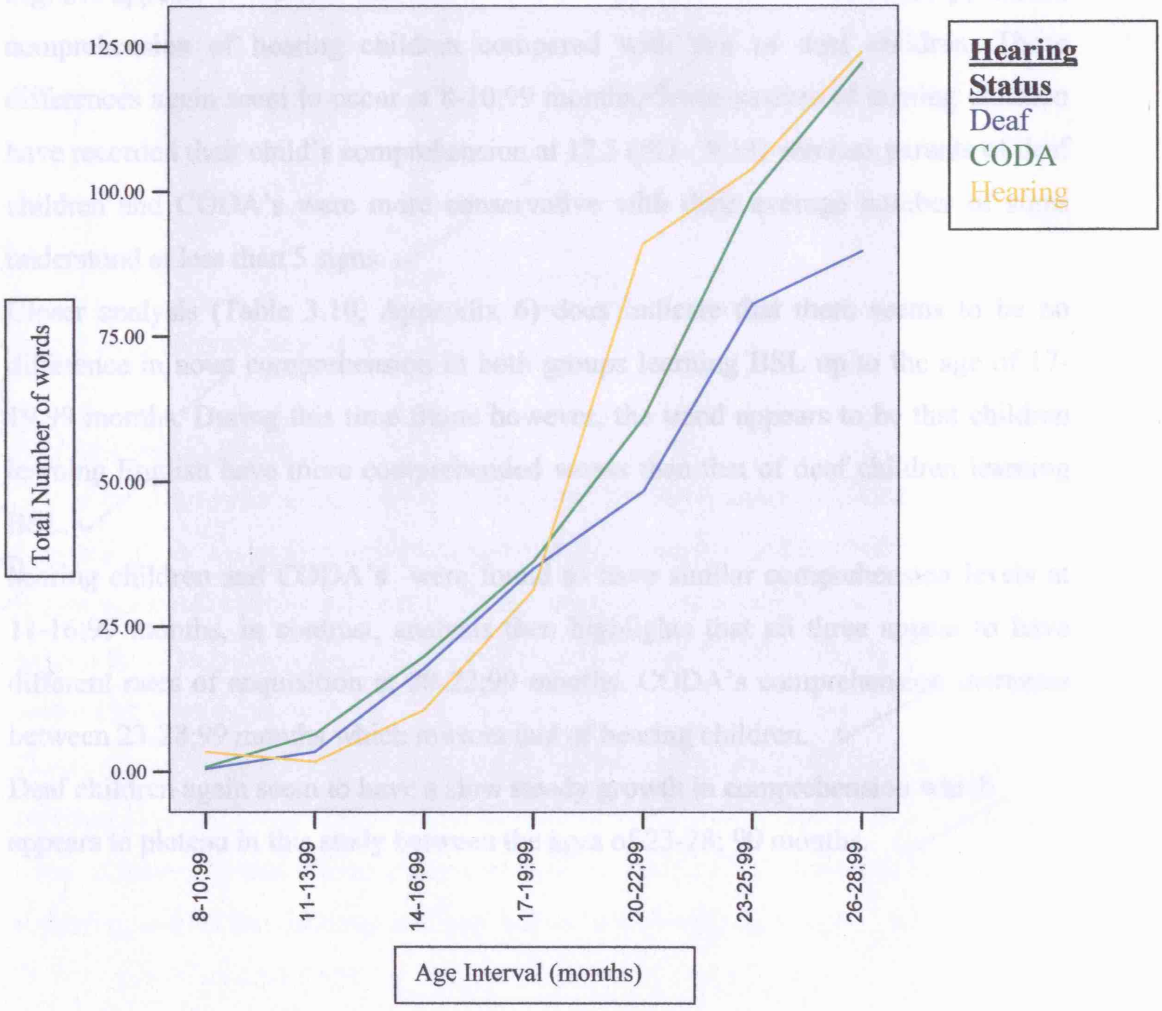


Fig 3.3: Noun production for all three groups

The graph also highlights the trend for CODA's noun production at 26-28;99 months, to be of a similar size. However there still does not appear to be a large jump in the number of produced noun as observed in children learning English.

Deaf children were found to have a smaller proportion of nouns, however the difference between hearing children, CODA's and deaf children was only significant at 20-22;99 months $p < .02$, just after hearing children have almost tripled their average noun production.

There does appear to be a large difference between hearing, CODA and deaf children at 26-28;99 months, but analysis suggests that this was not close to reaching any significance $p = .105$.

3.5 Noun Comprehension

Fig. 3.4 appears to indicate that again there is a potential difference in the perceived comprehension of hearing children compared with that of deaf children. These differences again seem to occur at 8-10.99 months. Some parents of hearing children have recorded their child's comprehension at 17.5 (SD - 9.19) whereas parents of deaf children and CODA's were more conservative with their average number of signs understood at less than 5 signs.

Closer analysis (Table 3.10, Appendix 6) does indicate that there seems to be no difference in noun comprehension in both groups learning BSL up to the age of 17-19.99 months. During this time frame however, the trend appears to be that children learning English have more comprehended words than that of deaf children learning BSL.

hearing children and CODA's were found to have similar comprehension levels at 11-16;99 months, in contrast, analysis then highlights that all three appear to have different rates of acquisition at 20-22;99 months. CODA's comprehension increases between 23-28;99 months which mirrors that of hearing children.

Deaf children again seem to have a slow steady growth in comprehension which appears to plateau in this study between the ages of 23-28; 99 months.

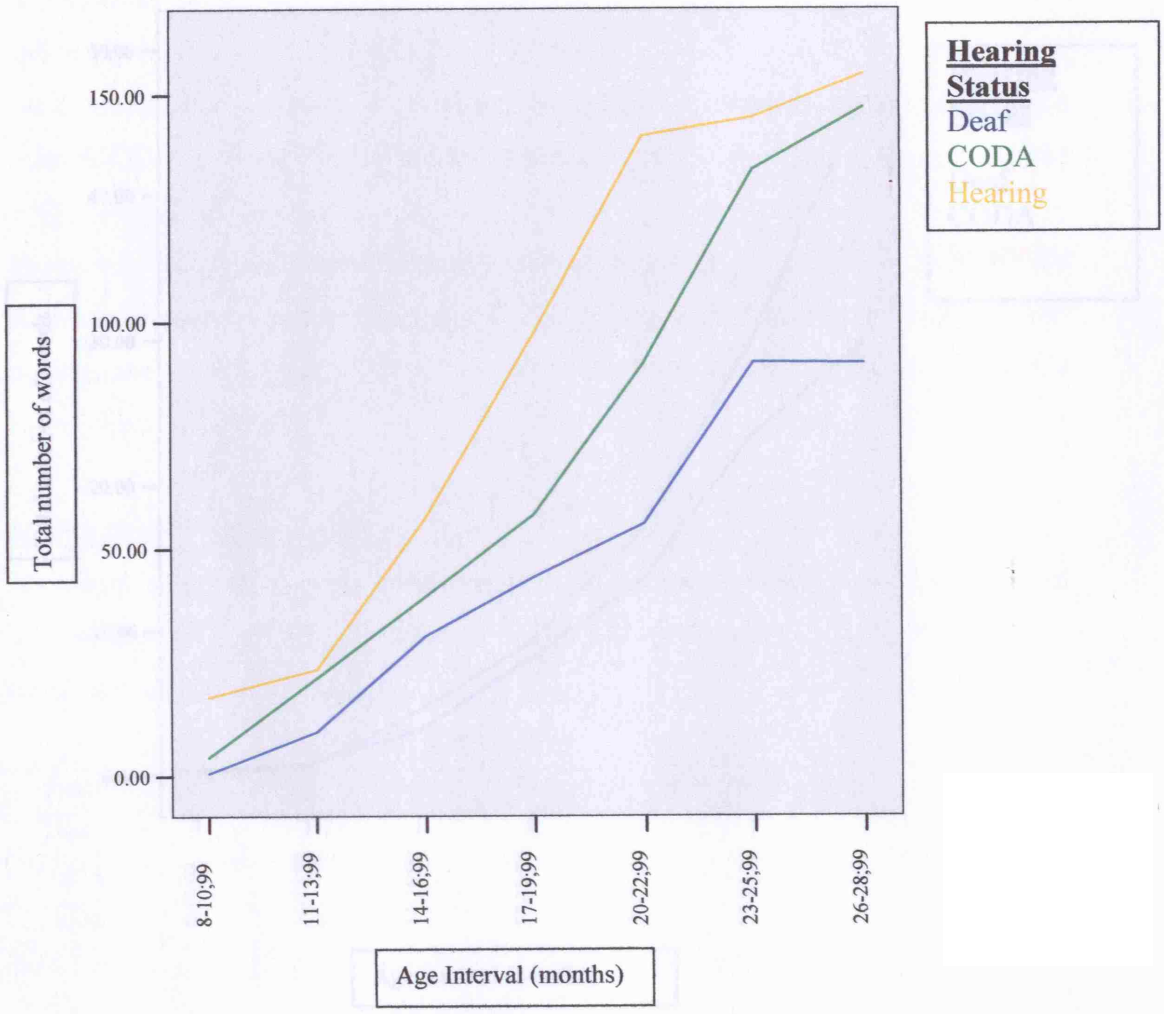


Fig 3.4: Noun comprehension all three groups

3.6 Predicate Production

One of the most contrasting factors, highlighted by closer analysis (Table 3.11, Appendix 6), to the noun production and overall production is that overall; all three groups apparently produce fewer predicate words. Hearing children at 26-28;99 months have an average number of predicate words: 48.80 (SD - 25.27) in their productive vocabularies.

The curves of the graph also indicate that predicate acquisition only begins to emerge between 11-17.99 months and that acquisition appears slower than of nouns. Another point of interest is that it seems that deaf children and CODA's have predicates appearing earlier than hearing children, in productive language.

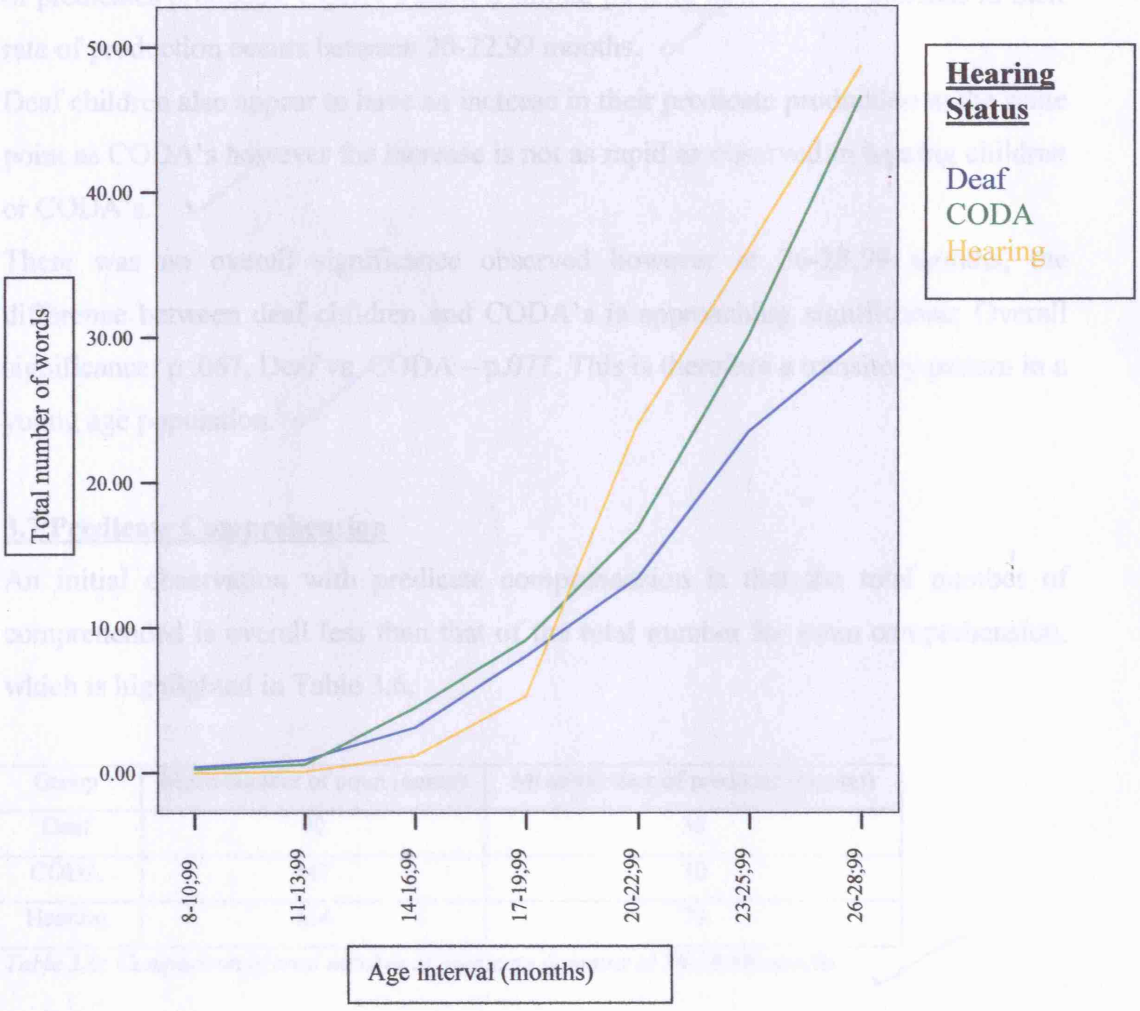


Fig 3.5: Predicate production all three groups

Analysis showed that although there is not an overall significance between all three groups. In contrast to this, closer analysis indicates that at 11-13;99 months, there appears to be a significant difference in the number of predicates produced by deaf children and hearing children ($p < .005$). Analysis indicates that at 14-16;99 months, there seems to be a significant difference in the developmental pattern between hearing children and CODA's ($p < .01$). However, after this period children learning English begin to increase the number of predicates used in their expressive language. Children learning BSL seem to have more predicates in their vocabulary between 8-19;99 months, than children learning English.

Though children learning English seem to have later emergence of predicates, once they reach the ages between 17-19.99 months there is a rapid increase in the number

of predicates produced. CODA's show a similar pattern; however the increase in their rate of production occurs between 20-22.99 months.

Deaf children also appear to have an increase in their predicate production at the same point as CODA's however the increase is not as rapid as observed in hearing children or CODA's.

There was no overall significance observed however at 26-28;99 months, the difference between deaf children and CODA's is approaching significance: Overall significance: p .067, Deaf vs. CODA – p.077. This is therefore a transitory pattern in a young age population.

3.7 Predicate Comprehension

An initial observation with predicate comprehension is that the total number of comprehended is overall less than that of the total number for noun comprehension, which is highlighted in Table 3.6.

Group	Mean number of noun (comp)	Mean number of predicates (comp)
Deaf	90	38
CODA	147	70
Hearing	154	73

Table 3.6: Comparison of total number of predicate & nouns at 26-28;99 months

The graph for predicate comprehension shows a slightly flatter line indicating a slower, steadier rate of predicate comprehension compared with that of noun comprehension.

Closer statistical analysis (Table 3.12, Appendix 6) indicates that overall there is no difference between the two groups learning BSL until 23-25;99 months. Once at this age, it appears that deaf children's' predicate comprehension plateaus in a similar way as in noun comprehension (see fig 3.5), however this may be due to errors in the methodology.

Through-out all the age intervals there is a consistently significant difference between deaf and hearing children. CODA's seems to show a similar trend to that of hearing children and this is most apparent from 23-25;99 months onwards.

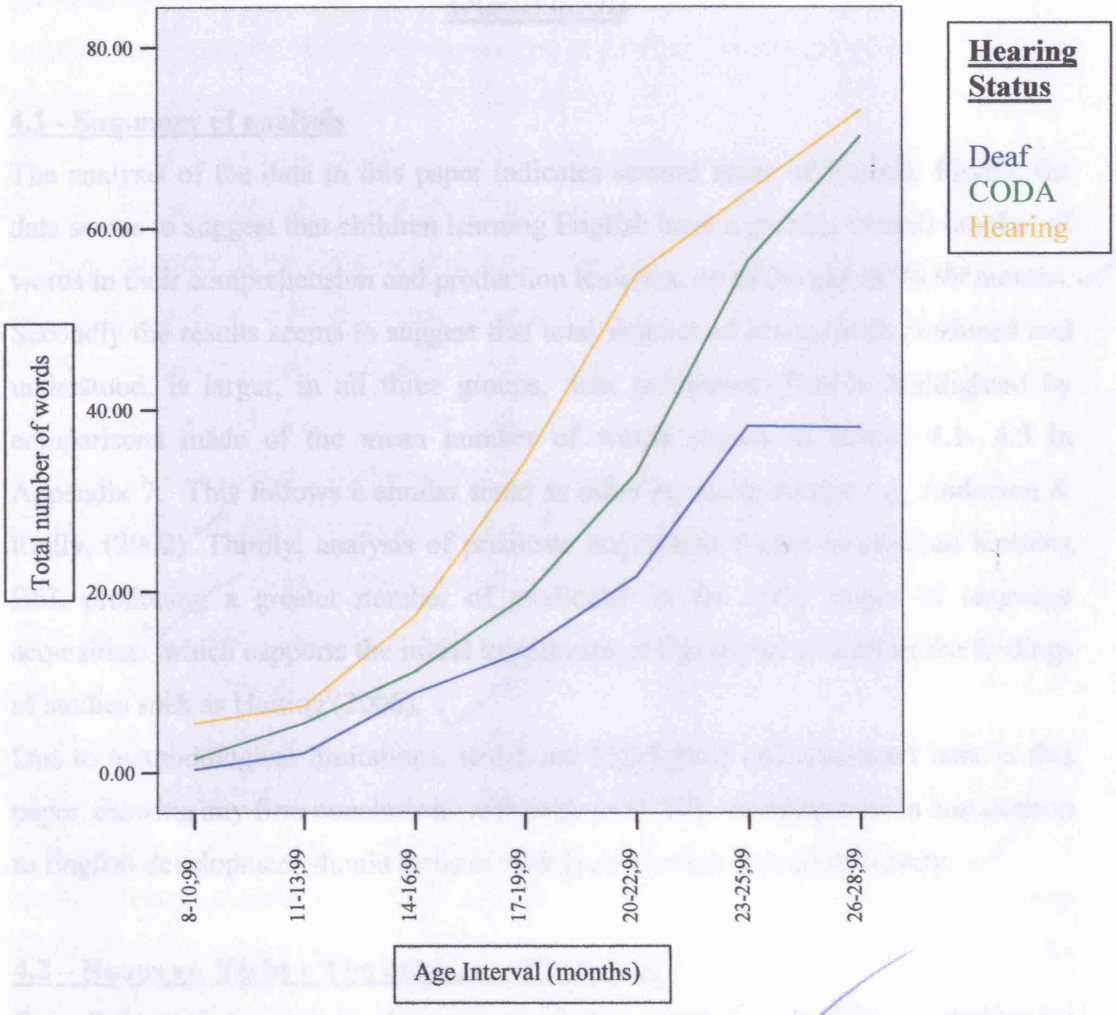


Fig 3.7: Predicate Comprehension for all three groups

Discussion

4.1 - Summary of analysis

The analysis of the data in this paper indicates several areas of interest. Firstly, the data seems to suggest that children learning English have a greater, overall number of words in their comprehension and production lexicons, up to the age of 28.99 months. Secondly the results seems to suggest that total number of nouns, both produced and understood, is larger, in all three groups, than predicates. This is highlighted by comparisons made of the mean number of words shown in Tables 4.1- 4.5 in Appendix 7. This follows a similar trend as other research studies e.g. Anderson & Reilly, (2002). Thirdly, analysis of predicate acquisition points to children learning BSL producing a greater number of predicates in the early stages of language acquisition, which supports the initial hypotheses of this paper, as well as the findings of studies such as Hoiting (2006).

Due to methodological limitations, which are highlighted and discussed later in this paper, drawing any firm conclusions with regards to BSL development in comparison to English development should be done with great caution if at all necessary.

4.2 – Nouns vs. Verbs – The influence of Typology

Overall the analysis supports the presence of noun dominance in early vocabulary for all three groups. The analysis indicates that, from a very young age, nouns are prominent within both BSL and English. This 'noun bias' in English may be explained through the ease in which young children perceive concepts for objects vs. concepts for actions (Gentner, 1982). Nouns also appear in more salient positions in English and are often used more in one-word utterances in child-adult interaction.

In contracts to expectations verbs/predicates were a smaller class of words in BSL's early vocabulary and did not at any stage occupy a greater proportion of children's expressive and receptive languages compared with that of nouns.

In comparison to nouns, there were far fewer verbs reported in both comprehension and production in both English and BSL. One reason for this may be due to parents under reporting the occurrence of verbs in their child's language. Gelman & Tardiff (1998) compared word-type proportions in children's spontaneous speech against maternal recall using the CDI. They found that mothers consistently under-reported

the number of 'action words' (verbs) that their children used. This may be a contributing factor as to why verbs occupy a smaller percentage of both BSL and English compared with nouns.

The later emergence of verbs in English, compared with BSL, maybe due to the gradual development of the system of grammar in a child's language as well as the growing maturity of the child to be able to understand a variety of situations.

The evidence does seem to suggest, that in early BSL development, there are more predicates than in early English development. Overall, a significant difference between BSL and English predicate production was only observed between 11-16; 99 months. This evidence initially supports the hypothesis for this study, that children learning BSL with have a greater number of predicates in their expressive languages, in the early stages of language development compared to children learning English. This perceived trend however, is not only observable for predicate production, put also for overall production and noun production. This may be linked with the manual babbling that has been observed in some studies e.g. Petitto & Marentette (1991). Deaf children may be have been credited with producing meaningful signs by their parents, whereas in contrast, children learning English, when vocalising, would not be credited for meaningful words. The results of this study seem to support the findings of other studies which have indicated that deaf children begin producing signs earlier than children who are learning English (Anderson & Reilly, 2002; Bonvillian & Folven 1987; Conlin et al. 2000).

4. 3 - Classification of words

The focus of this paper is predominantly on verb vs. noun production and comprehension. However, what has not been addressed or discussed is the appropriacy of the labels 'noun' and 'verb' or 'predicate'. Both CDI's look at vocabulary at the single word level with no contextual information gathered from the forms.

As indicated in the review of current literature, first words of children learning English and children learning BSL, fall into very similar categories (Fenson et al., 1994; Clarke, 1978). Clarke (2003) in contrast, indicated that these are 'single word utterances so it is not possible to assign the words to grammatical word classes such as nouns and verbs.' Stern & Stern (1928) also said that 'to label single-word

utterances as consisting of nouns or verbs attributes additional knowledge about such term to very young children, knowledge they are not yet likely to have.'

For words to be put into these grammatical classes contextual information is needed to aid with classification and this is especially important for predicate classification. It is also important to question the assumption that what are nouns for adults are not necessarily nouns for children. As noted in the Hoiting (2006) study, 'predicate' is not the most appropriate reference to verbs as they are not placed in connected speech. As in Hoiting's study, this study compensated by placing verbs and adjectives together to form a 'predicate' class.

Because of these inaccuracies in classification it is not appropriate to conclude that during early BSL development there are more verbs in BSL than English.

4.4 – Methodological Limitations

4.4.1 – Sample size

Due to the nature of this study and working within the field of BSL research, the population studied was significantly smaller than that of the population of children learning English. The small sample size of children learning BSL is a limiting factor and further research would need to have a larger sample size.

One of the core limitations of this study, and one which impacts significantly on the findings and conclusions, is the omission of data for the population of older children learning BSL. As the methodology outlined, to more evenly match the Oxford CDI and BSL CDI, data was only included from the BSL CDI up to the age of 28;99, even though data was available up to 37;99 months. Had this data been included it would have revealed an apparent rapid growth in deaf children's overall comprehension and production e.g. Fig 4.1. The same can also be demonstrated for noun and predicate production expressive and receptive language (see Fig 4.2 and Fig 4.3 for examples); therefore showing transitory pattern in the results. The other graphs demonstrating these trends can be found in Appendix 8. BINGO

The implications of this may have huge significance for this study. Had the Oxford CDI been extended to include children from an older age group, would there have been indications of all three groups having similar language development as they aged? Further studies should look to ensure that there is data for a wide range of ages, as this may significantly impact on the overall conclusions. One of these may include

that BSL, as a language of its own, has a different rate of development compared with English.

A difficulty with using data from the Oxford CDI is that it is unknown how the population for this study was chosen. These children may not be representative of the general population. Although there was a large sample size in comparison to that of deaf children and CODA's, at later stages of the research studies e.g. at 26-28;99 months, only 5 children were sampled, compared with 12 and 15 deaf children and CODA's respectively. Therefore it is with caution that any firm conclusions are made between English and BSL as the sample size is very small. It may also be that the children at this point in the study are children with higher than average language abilities compared with the general population and therefore not a representative sample. If the study were to be repeated, a consistent larger number of children at each age interval would be beneficial to chart, with increased accuracy, the development of BSL and English.

One of the most impacting and influential variables in this study are the parents/ carers who complete the form. Parents completing the BSL CDI were initially interviewed and given advice and guidance on how to complete the forms. There is a question of parent's consistency when filling out the forms over a longitudinal study such as this one.

This is one of the key weaknesses in using parental tools as a means of data collection. With the CDI it is possible that parents completed the forms from recalling their child's signs rather than actually recording the signs when they happen.

To ensure that this type of error was minimal, the distribution for the first two forms was examined to see if the distribution of the curves followed a similar line. Data analysis was conducted on 54 children, whose scores between the first and second data sets were correlated. This analysis demonstrated exceptionally high reliability scores for both production ($r=.95$, $p< .001$) and comprehension ($r=.86$, $p<.001$). On occasions, when parents gave total word scores for both production and comprehension of more than 150 words, they were sent copies of previously completed forms to help them recall what had been ticked on the forms before.

Another difficulty with this assessment tool is that parents are often keen for their child to score 'well' on these forms which can influence their perception of their child's abilities. Some parents seem to be prone to granting their children 'credit' for

vocalisations and gestures which are not true words (Spencer, 1993). This may result in the overestimation in the size of vocabulary in all three groups.

Results for all three groups, highlights comprehension as consistently having a greater number of words than their expressive vocabulary. Comprehension scoring is more of subjective idea than that of production and therefore it is easier for parents to over estimate the extent at which their child understands them.

Deaf children and CODA's may have a smaller number of words in their receptive vocabulary due to the fact vocalisations in hearing children, in response to their parents, may be judged as the child responding and understanding what is being said. This is more challenging in BSL because language learning needs constant joint attention between adult and child. If a child does not respond with an appropriate sign to a parent's communication, it is possible that some parents interpret this as their child not understanding them.

4.4.2 – Research Methods

Another influential factor that limits this study and its conclusions is the method of data collection. Though both the Oxford CDI and BSL CDI used the same method for data collection, the BSL CDI data was a repeated measure, where families completed the forms every three months.

The Deaf community is a relatively small community in comparison to the hearing community and language development and acquisition of deaf children is a constant area of research, with many families involved in multiple research projects. Reviews of this type of assessment have shown that when parents are willing to complete the form it has a high validity and reliability. It is currently one of the only ways in which to document emerging vocabulary (Lederberg et al. 2003). The high number of forms over the course of this study may have affected parent's willingness to fill out the forms and also impact on the accuracy of the overall findings. The may have impacted this study, and explain why in noun and predicate comprehension a plateaux can be seen later between 23-28; 99 months.

4.4.3 – Modifications to the data

Due to the different presentations of the data in the Oxford CDI and the BSL CDI, modifications had to be made to some aspects of the data to make the two sets

comparable. The ramifications of the modifications may have had potential limitations.

One of the limiting factors arises from the conversion of data from the Oxford CDI into the BSL CDI. During this process, some scores from the Oxford CDI were transferred into categories that were only similar to the original form i.e. Stone (Oxford) was placed into the category 'rock' (BSL CDI). The affects of this are unknown, yet manipulating the data so that it conforms to a prefixed layout, may have significant implications. It also may slightly misrepresent the type of vocabulary English has in comparison to BSL.

The omission of some words not found in both CDI forms is also a limiting factor to this study. By omitting these words, it again misrepresents the content and size of the vocabulary lexicon for all three groups and may have adversely influenced the overall results of this study.

If the study were to be repeated, items should ideally remain in the same as well compensation made during analysis for words omitted from the hearing children's vocabulary as well as deaf children and CODA's.

The Oxford CDI had some pre-existing limitations which impacted on this study. As shown in the methodology the Oxford CDI did not separate production from comprehension. This implies that for a child to say a word he/she has to understand it. This does not necessarily have to be the case. There were a few instances of forms with parents on the BSL CDI who had ticked that their child produced a sign, however had not ticked the corresponding box to indicate that the child also understood the meaning of the sign. This phenomena in children's language acquisition has been highlighted by studies such as Griffith & Atkinson (1978) whose study looked at children between the ages of 1;7-2;5 years who had all learnt the word *door*. This word was found to be used consistently for openings things e.g. opening boxes, taking clothes off a doll. This is known as "over extension". This therefore implies that though a child may produce a word, it does not necessarily have to understand that words meaning. In relation to the Oxford CDI, this could therefore mean that some children may have been credited with a larger receptive vocabulary, due to the nature of the CDI form. This may go toward explaining why English had a consistently larger number of words in the receptive language compared with that of BSL.

A drawback with the BSL CDI form is noted when looking at groupings of words, and the impact of these during the conversion of data. Some categories contained groups of words e.g. he/she/it, which in the Oxford CDI, were kept as separate items. By grouping these words in this way, it is not clear as to whether the children have to sign all three to qualify to score in this category, or if they are credited a score in that category if they produce or understand only one of the three items. During conversion of these scores an average was taken and an individual score was given for each item. Due to the ambiguity of this grouping, it is highly probable that the average score presented in the final database, were not accurate representations. This impacts on the appropriateness of the comments and conclusions on deaf children and CODA's language abilities.

4.5 – Other influential factors

One factor that may have influenced BSL research findings is that children taking part in this study were not screened for potential co-morbid conditions, which may impact on a child's communicative abilities as well as the rate at which language is acquired. Deafness and hearing loss is a significant feature of at least 396 multiple anomaly syndromes, with some of the more common ones including: Usher Syndrome (US), Stickler Syndrome and mitochondrial disorders. 3-6 % of all deaf children have US (NIDCD). Depending on the type of US a child has, the impact on the communication is variable.

Rosenhall et al. (1999) studied children with autistic disorders and conducted an audiological evaluation on them. They found that 7.9% had mild to moderate hearing loss as well as 3.5% having pronounced to profound bilateral hearing loss or deafness. Children on the autistic spectrum show a tendency for delayed language acquisition.

Due to the high rate of deafness and co-morbid factors which have implications on communications, any children present in the study sample with co-existing factors, may have influenced the overall findings of this study. Future studies, should attempt to screen deaf children for potential co-morbid conditions.

A general feature that affects not only this study, but also other studies looking at BSL acquisition, is the appropriateness of comparing spoken languages with signed languages. As indicated in this study, one of the major differences between English and BSL is the typology of the language. Trying to chart both English and BSL using

a universal assessment means that the inherent diversity of these languages are over looked or simplified.

Assessments such as the CDI will have a natural bias toward the language in which it was originally designed for. Though assessments such as the CDI strive to adapt to suit other languages such as ASL and BSL, 'we still use many familiar classical categories from English and other language' e.g. nouns and verbs' (Slobin, 2006) to describe ASL and BSL development. This bias can impact on how researchers interpret results and findings and by comparing BSL to English, there can be inherent implications for BSL development to be found to be 'less' than English development. Alternatively, if comparisons between the two are abandoned, this may allow us to view BSL as a separate language and one that is unique in its development.

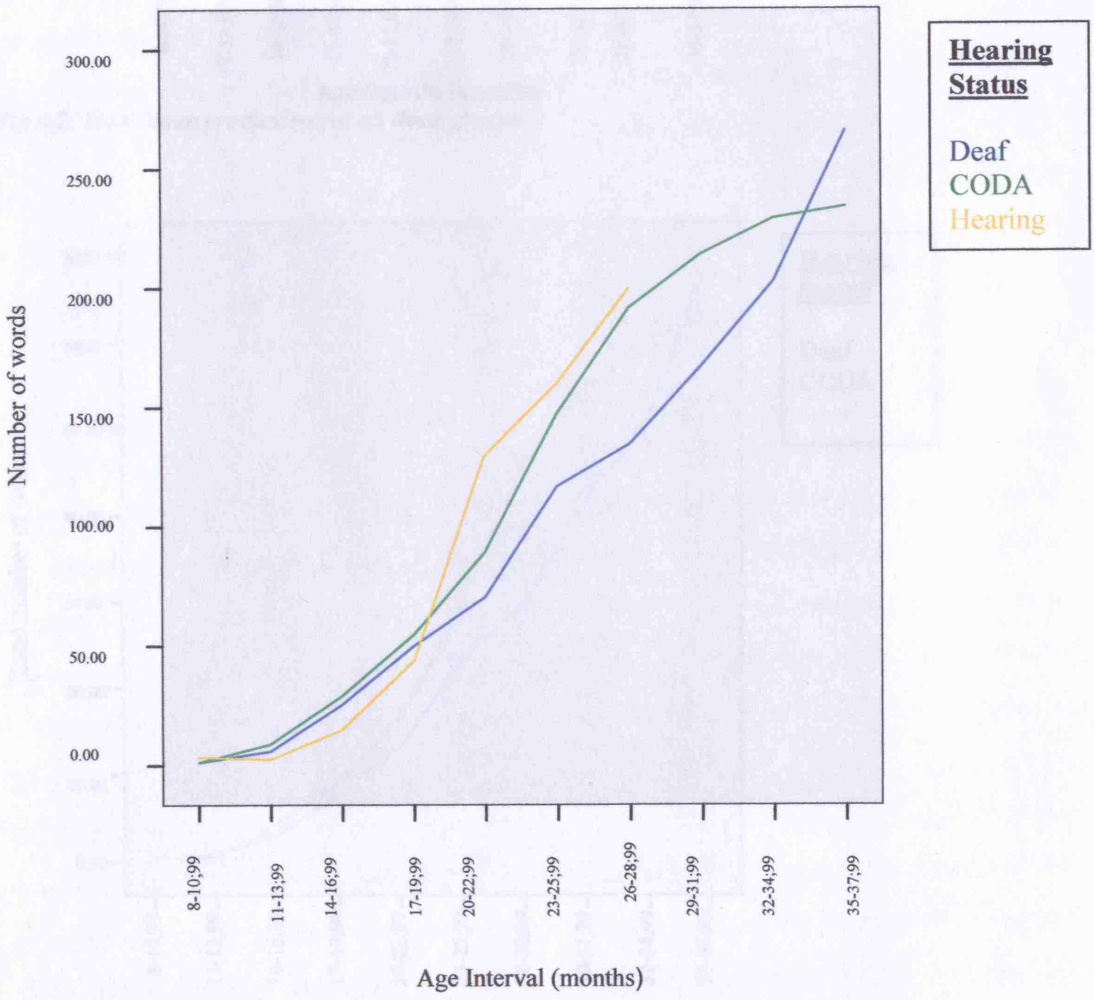


Fig. 4.1 Total production for all three groups

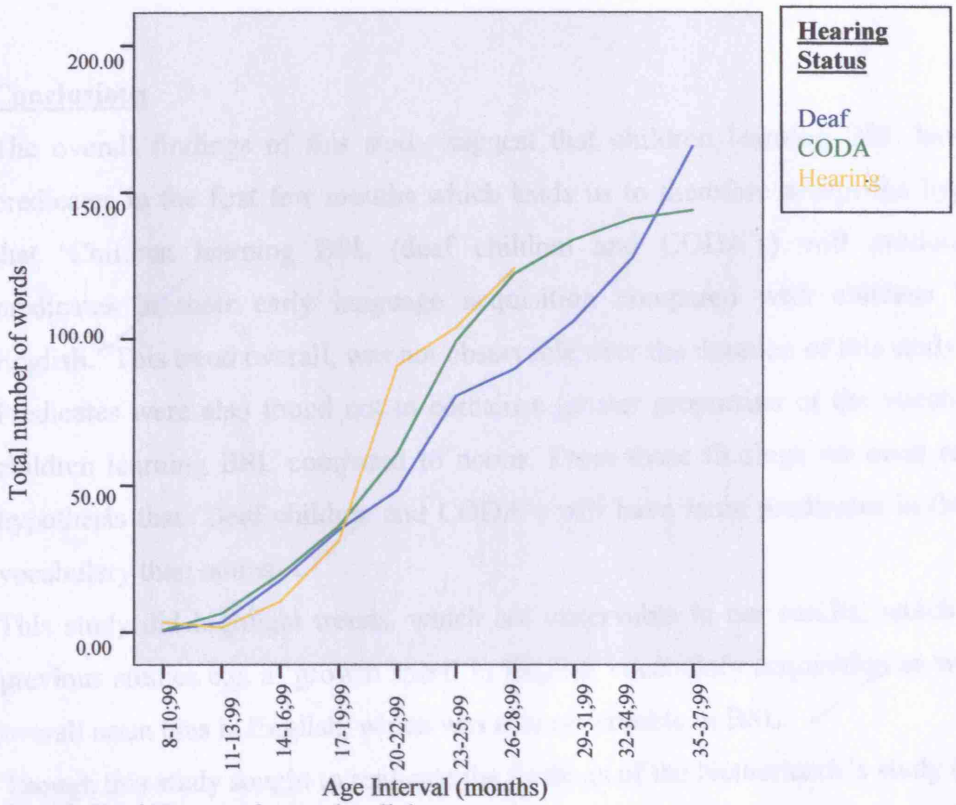
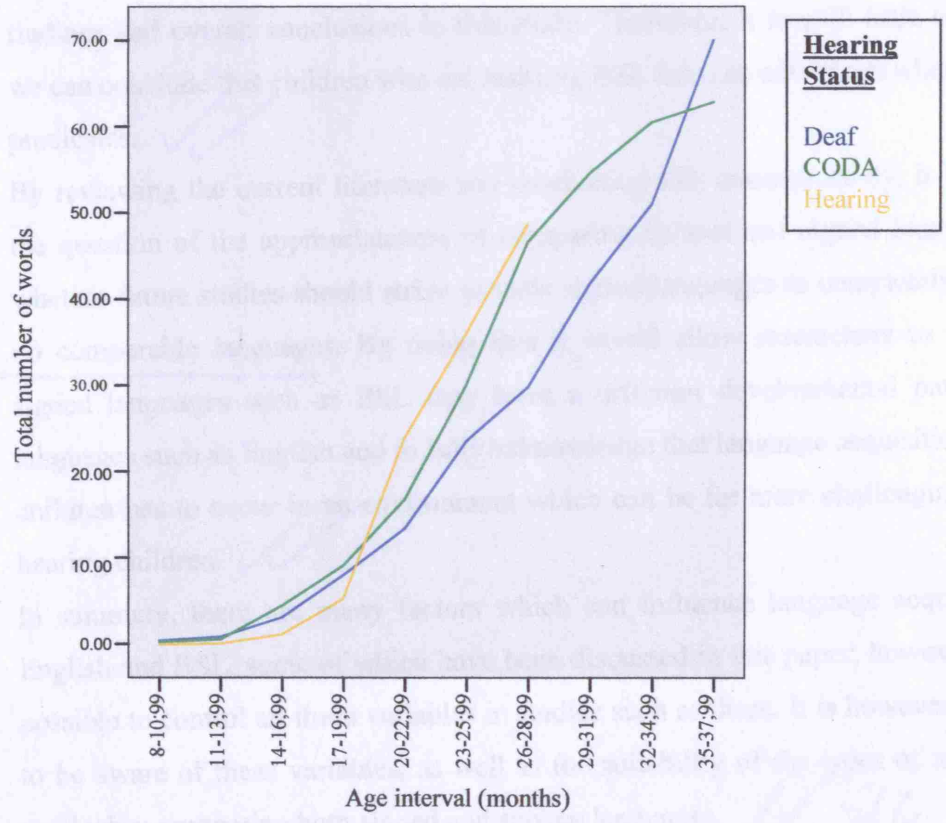


Fig 4.2: Total Noun production for all three groups



4.3: Predicate production for all three groups

Conclusions

The overall findings of this study suggest that children learning BSL have more predicates in the first few months which leads us to therefore accept the hypothesis that 'Children learning BSL (deaf children and CODA's) will produce more predicates in their early language acquisition compared with children learning English.' This trend overall, was not observable over the duration of this study.

Predicates were also found not to contain a greater proportion of the vocabulary of children learning BSL compared to nouns. From these findings we must reject the hypothesis that 'Deaf children and CODA's will have more predicates in their early vocabulary than nouns'.

This study did highlight trends, which are observable in our results, which support previous studies e.g. a 'growth spurt' in English vocabulary acquisition as well as an overall noun bias in English, which was also observable in BSL.

Though this study sought to replicate the findings of the Netherlands's study (Hoiting, 2006) due to a variety of methodological weaknesses including small sample size and inaccurate data modifications, we are unable to attribute total confidence in the findings and overall conclusions in this study. Therefore, it is with little confidence we can conclude that children who are learning BSL have an advantage when learning predicates.

By reviewing the current literature and conducting this research study, it has raised the question of the appropriateness of comparing spoken and signed languages and whether future studies should strive to view signed languages as completely separate, no comparable languages. By doing this it would allow researchers to show that signed languages such as BSL may have a different developmental pattern from languages such as English and to fully acknowledge that language acquisition for deaf children has to occur in an environment which can be far more challenging than for hearing children.

In summary, there are many factors which can influence language acquisition for English and BSL, some of which have been discussed in this paper; however it is not possible to control all these variables in studies such as these. It is however important to be aware of these variables, as well as the suitability of the types of assessments used when comparing both signed and spoken languages.

VG.

References

Anderson, D.E., & Reilly, J.S. (2002) The MacArthur Communicative Development Inventory for American Sign Language: The normative data. Journal of Deaf Studies & Deaf Education 7, 83-106

Baker, A. E. & van den Bogaerde, B. (2006) Factors influencing child CODA's early bilingual language acquisition. On: http://www.tislr9.ufsc.br/talks/anne_e_baker_b_van_den_bogaerde.pdf

Barrett, M. (1995). Early Lexical Development. In P. Fletcher & B. McWhinney (Eds.) *The handbook of child language (pp.211-241).* Cambridge, MA: Blackwell

Bates, E., Marchman, V.A., Thal, D., Fenson, L., Dale, P., Reznick, J.S., et al. (1994) Development and stylistic variation in the composition of early vocabulary. *Journal of Child Language, 21,* 85-123.

Benedict (1979) cited In: Owen, RE., (2001*) Language development: an introduction* 5th edition. Allyn and Bacon

Bertoncini, J. & Nazzi, T. (2003) Before and after the vocabulary spurt: two modes of word acquisition. In *Developmental Science 6:2* (pp. 136-142)

Bonvillian, J. (1999) Sign Language Development. Pp 277- 310. In M. Barrett (Ed). The development of language. Psychology Press

Bonvillian, J. D & Folven, R. J. (1987) The onset of signing in young children. In. Capirci, O., Iverson, J.M., Montanari, S. & Volterra, V. (2002) Gestural, signed and spoken modalities in early language development: The role of linguistic input. *Bilingualism: Language and Cognition 5 (1)* 25-35. Cambridge University Press.

Bonvillian, J.D., Orlansky, M.D., & Novack, L.L. (1983) Developmental milestones: Sign language acquisition and motor development. On: http://www.jstor.org/view/00093920/ap030213/03a00090/0

Brown, P. (1998). Children's first verbs in Tzeltal: Evidence for an early verb category. *Linguistics*, 36(4), 713-753

Caselli, M., Bates, E., Casadio, P., Fenson, J., Fenson, L., Sanderl, L., & Weir, J. (1995). A cross-linguistic study of early lexical development. *Cognitive Development, 10,* 159-199.

Clarke, E.V. (1978) Discovering what words can do. In D. Farkas, W.m> Jacobsen, & K.W. Todrys (Eds.), *Papers from the parasession on the lexicon* (pp.34-37). Chicago: Chicago Linguistics Society.

Clarke, E.V. (2003). First Language Acquisition. Cambridge Press.

Conlin, K.E., Mirus, G>r., Mauk, C., & Meier, R.P. (2000) Acquisition of first signs: Place, handshape and movement. In. C. Chamberlain, J.p. Morford, & R.I. Mayberry (Eds.), *Language acquisition by eye*. Mahwah, NJ: Lawrence Erlbaum Associates Inc.

Dapretto, M.J., & Bjork, E. (2000). The development of word retrieval abilities in the second year and its relation to early vocabulary growth. *Child Development, 71, 635-648.*

de Leon, L. (1999). *Why Tzotzil children prefer verbs over nouns*. Paper presented at the Fourth International Conference for Study of child language. San Sebastian, Donostia, Spain

de Villiers, J.G., & de Villiers, P.A. (1978) Language acquisition. Cambridge, MA: Harvard University Press.

Fenson et al. (1993) In. D. Anderson & J. Reilly. *The MacArthur Communicative Development Inventory: Normative Data for American Sign Language*

Fenson et al. (1994) In E.V. Clark. *First Language Acquisition.* Cambridge University Press

Folven, R.J., & Bonvillian, J.D. (1991) The transition from nonreferential to referential language in children acquiring American Sign Language. *Developmental Psychology, 27,* 806-816

Gelman & Tardiff (1998) In *E.V. Clarke, (2003). First Language Acquisition. Chapter 4: Early words pp.70-89.* Cambridge University Press,

Gentner, D. (1982) Why nouns are learned before verbs: Linguistic relativity versus natural partitioning. In S.A. Kuczaj (Ed.), *Language development: Vol. 2. Language, thought, and culture* (pp.301-334) Hillsdale, NJ: Lawrence Erlbaum.

Griffiths & Atkinson (1978) cited In. E.V. Clarke, (2003). First Language Acquisition. Cambridge Press.

Hamilton, A., Plunkett, K., & Schafer, G., (2000) Infant vocabulary development assessed with a British Communicative Development Inventory: Lower scores in the UK than the USA. *Journal of Child Language, 27,* 689-705.

Hoiting, N. (2006) Deaf Children are verb attenders: Early Sign Vocabulary Development in Dutch Toddlers (pp. 161-188). In Marschark, M., Schick, B., & Spencer, PE. (Eds.) (2006). *Advances in the Sign Language development of deaf children.* Oxford University Press

Hoiting, N., & Slobin, D.I. (2003). *Motion and space in sign languages.* Colloquium, Max Planck Institute for Psycholinguistics, Mijmegen.

Lederberg, A.R., & Prezbindowski, A.K. (2003) Vocabulary assessment of Deaf and Hard-Of-Hearing children from infancy through the preschool years. Journal of Deaf Studies and Deaf Education, 8.

Marschark, M., Schick, B., & Spencer, PE. (Eds.) (2006). *Understand Sign Language Development of Deaf children.* (pp. 3-19) Advances in the Sign Language development of deaf children. Oxford University Press

Milroy & Muysken (1995) In: Baker, A. E. & van den Bogaerde, B. (2006) Factors influencing child CODA's early bilingual language acquisition. On: http://www.tislr9.ufsc.br/talks/anne_e_baker_b_van_den_bogaerde.pdf

National Institute on Deafness and Other Communication Disorders http://www.nidcd.nih.gov/health/hearing/usher.htm#e

Nelson (1973) In: *The development of Language: studies in development of language psychology*. Edited by Barrett, M. Psychology press

Nicholas, J. (1986). Head-marking and dependent-marking grammar. *Language, 62,* 56-119

Ogura, T., Yamashia, Y., Murase, T., & Dale, P. (1993). *Some preliminary findings from the Japanese Early Communicative Development Inventory*. In. Anderson, D.E., & Reilly, J.S. (2002) The MacArthur Communicative Development Inventory for American Sign Language: The normative data. Journal of Deaf Studies & Deaf Education 7, 83-106

Owen, RE., (2001) Language development: an introduction 5th edition. Allyn and Bacon

Paul. PV., (2001) Language and Deafness 3rd. Singular Thomson Learning

Petitto, L.A. (2000) The acquisition of natural signed languages: Lessons in the Nature of Human Language and its Biological foundations. Pp.41-50 In C. Chamberlain., J.P. Morford., & K.I. Mayberry (Eds*) Language Acquisition*. Lawrence Erlbaum Associates, Publishers. London

Petitto, L.A. & Marentette, P. F. (1991) Babbling in the manual mode: Evidence for the ontogeny of language. Science, 251, 1493-1496

Prinz, P. M. & Prinz, E. A. (1979) Simultaneous acquisition of ASL and spoken English (pp. 283-296). Sign Language Studies 8:25

Rosenhall, V., Nordin, V., Sandstrom, M., Ashlen, G., & Gillberg, C. (1999) Autism and Hearing loss. *Journal of Autism developmental disorders, 29(5)*: 349-57

Slobin, D.I. (2006) Issues of Linguistic Typology in the Study of Sign Language Development of Deaf Children. In Marschark, M., Schick, B., & Spencer, PE. (Eds.) (2006). *Advances in the Sign Language development of deaf children.* Oxford University Press

Spencer, P.E. (1993). The expressive communication of hearing mothers and deaf infants. *American Annuals of the Deaf, 138(3),* 275-283

Stern & Stern (1928). In. E.V. Clarke. First Language Acquisition. Cambridge University Press.

Stokoe, W. C. (1960). *Sign language structure: An outline of the visual communication system of the American deaf.* Studies in Linguistics, Occasional Papers 8. Buffalo, NY: Department of Anthropology and Linguistics, University of Buffalo. (Reprinted in Journal of Deaf studies and Deaf Education, 10, 000-000, 2005)

Thal, D., Jackson-Maldonado, D., Bates, E., Marchman, V., & Gutierrez-Clellen, V. (1993). Early Lexical development of Spanish-speaking infants and toddlers. *Journal of Children Language, 20,* 523-549.

Woll, B (1998). Development of signed and spoken languages. In Gregory, S & Powers, S (Eds) *Issues in Deaf education.* Multilingual Matters

Appendix One

Anderson & Reilly (2002): Summary of Findings.

Anderson & Reilly (2002): Summary of Findings.

Age Group	Mean *n* signs produced	Median *n* signs produced	Range of productive sign vocabulary
8-11 months (*n* = 7)	8	3	2-17
12-17 months (*n* = 12)	61	62	7-107
18-23 months (*n*=15)	149	138	39-348
24-29 months (*n*=16)	252	261	102-417
30-35 months (*n*=19)	380	411	249-518

Table 1.7: Descriptive statistics of children's productive sign vocabularies. (Anderson & Reilly, 2002)

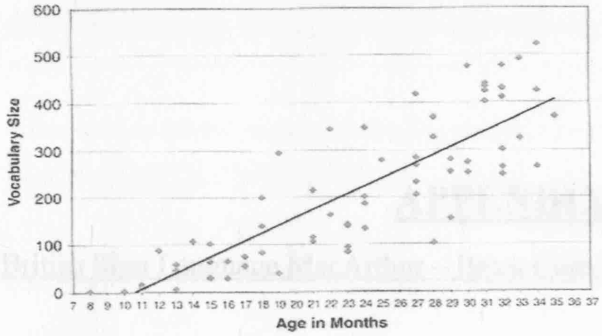


Fig: 1.8: Development of productive vocabulary from 8 to 30 months

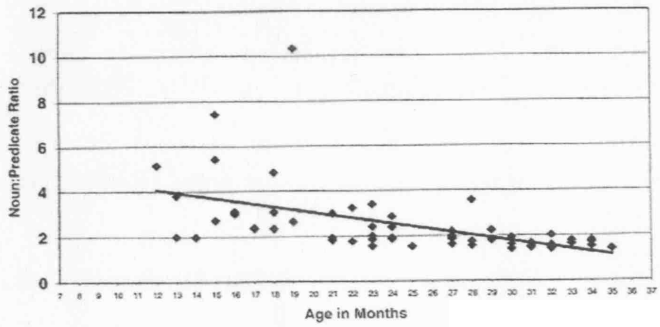


Fig: 1.9:Noun: predicate Ratio by age

APPENDIX 2

British Sign Language MacArthur – Bates Communicative Development Inventory

Code: **Date:**

Early Understanding of Signs

Before children begin to sign they understand what signs mean. They respond to people signing familiar signs and phrases. Below are some examples of phrases. Does your child do any of these?

Respond to NO or FINISH by stopping what he/she is doing?	Yes	No
Look for mummy/daddy if you sign WHERE MUMMY/DADDY?	Yes	No

In the list below, tick the boxes next to the sign phrases your child understands

SIGN PHRASES (U = UNDERSTANDS, S = SIGNS)

	U	S		U	S		U	S
BE-CAREFUL	☐	☐	GET-UP	☐	☐	SPIT IT OUT	☐	☐
BRING-ME	☐	☐	GIVE-TO MUMMY	☐	☐	TIME GO BYE-BYE	☐	☐
CHANGE NAPPY	☐	☐	GIVE-ME HUG	☐	☐	THROW BALL	☐	☐
COME-HERE	☐	☐	GIVE-ME KISS	☐	☐	YOU HUNGRY?	☐	☐
DADDY/MUMMY HOME	☐	☐	GOOD GIRL/BOY	☐	☐	YOU TIRED/SLEEPY?	☐	☐
DON'T TOUCH/NO TOUCH	☐	☐	OPEN YOUR MOUTH	☐	☐	YOU-WANT GO	☐	☐
FINISH	☐	☐	SIT-DOWN	☐	☐	YOU-WANT MORE	☐	☐

Please look though the list of words below and put a tick in the box next to any word your child signs/understands. If your child signs/understands a different word from the one given on the list (e.g.*truck* instead of *lorry*, *moo* instead of *cow*) then tick the word anyway.

Don't worry if your child only signs/understands a few or none of the words on the list as the list is a collection of words used by many children of different ages.

ANIMALS:	**(U = UNDERSTANDS, S = SIGNS)**											
	U		**S**			**U**	**S**				**U**	**S**
1. crocodile	☐	☐	13. duck			☐	☐	25. rooster			☐	☐
2. ant/bug	☐	☐	14. elephant			☐	☐	26. sheep			☐	☐
3. bear	☐	☐	15. fish			☐	☐	27. snake			☐	☐
4. bee	☐	☐	16. frog			☐	☐	28. squirrel			☐	☐
5. bird/chicken	☐	☐	17. giraffe			☐	☐	29. tiger			☐	☐
6. bunny/rabbit	☐	☐	18. hen			☐	☐	30. turkey			☐	☐
7. butterfly	☐	☐	19. horse			☐	☐	31. turtle			☐	☐
8. cat	☐	☐	20. lion			☐	☐	32. wolf			☐	☐
9. cow	☐	☐	21. monkey			☐	☐					
10. deer	☐	☐	22. mouse			☐	☐					
11. dog	☐	☐	23. owl			☐	☐					
12. donkey	☐	☐	24. pig			☐	☐					
Other animal words:												

FOOD AND DRINK:		(U = UNDERSTANDS, S = SIGNS)											
		U	S			U	S			U	S		
1.	apple	□	□	20.	fish	□	□	39.	ice lolly	□	□		
2.	banana	□	□	21.	food	□	□	40.	potato	□	□		
3.	baked beans	□	□	22.	chips	□	□	41.	crisps	□	□		
4.	bread	□	□	23.	grapes	□	□	42.	jam	□	□		
5.	butter	□	□	24.	carrots	□	□	43.	salad	□	□		
6.	cake	□	□	25.	gum	□	□	44.	salt	□	□		
7.	sweets	□	□	26.	hamburger	□	□	45.	sandwich	□	□		
8.	cereal	□	□	27.	ice	□	□	46.	sauce	□	□		
9.	cheese	□	□	28.	ice cream	□	□	47.	fizzy drink/pop	□	□		
10.	chicken	□	□	29.	jelly	□	□	48.	soup	□	□		
11.	chocolate	□	□	30.	juice	□	□	49.	spaghetti	□	□		
12.	coffee	□	□	31.	lollipop	□	□	50.	strawberry	□	□		
13.	coke	□	□	32.	meat	□	□	51.	tea	□	□		
14.	biscuit	□	□	33.	milk	□	□	52.	toast	□	□		
15.	corn	□	□	34.	nuts	□	□	53.	vanilla	□	□		
16.	cracker	□	□	35.	orange	□	□	54.	vitamins	□	□		
17.	doughnut	□	□	36.	peanut butter	□	□	55.	water	□	□		
18.	drink	□	□	37.	pizza	□	□	56.	watermelon	□	□		

Other food/drink words:

PEOPLE: **(U = UNDERSTANDS, S = SIGNS)**

	U	S		U	S		U	S
1. aunt	☐	☐	12. doctor	☐	☐	23. people	☐	☐
2. baby	☐	☐	13. fireman	☐	☐	24. person	☐	☐
3. babysitter	☐	☐	14. friend	☐	☐	25. Pet's name	☐	☐
4. Babysitter's name	☐	☐	15. girl	☐	☐	26. police	☐	☐
5. boy	☐	☐	16. grandma	☐	☐	27. Father Christmas	☐	☐
6. brother	☐	☐	17. grandpa	☐	☐	28. sister	☐	☐
7. Child's own name	☐	☐	18. Indian	☐	☐	29. teacher	☐	☐
8. child/kid	☐	☐	19. postman	☐	☐	30. uncle	☐	☐
9. clown	☐	☐	20. man	☐	☐	31. woman	☐	☐
10. cowboy	☐	☐	21. mummy	☐	☐			
11. daddy	☐	☐	22. nurse	☐	☐			

Other words:

SMALL HOUSEHOLD ITEMS: (U = UNDERSTANDS, S = SIGNS)

	U	S		U	S		U	S
1. plaster	☐	☐	15. jar	☐	☐	29. purse	☐	☐
2. basket	☐	☐	16. keys	☐	☐	30. radio	☐	☐
3. blanket	☐	☐	17. knife	☐	☐	31. scissors	☐	☐
4. bottle	☐	☐	18. light	☐	☐	32. soap	☐	☐
5. box	☐	☐	19. medicine	☐	☐	33. spoon	☐	☐
6. bowl	☐	☐	20. mirror	☐	☐	34. tape	☐	☐
7. broom	☐	☐	21. money	☐	☐	35. telephone	☐	☐
8. brush	☐	☐	22. mop	☐	☐	36. tissue	☐	☐
9. camera	☐	☐	23. napkin	☐	☐	37. toothbrush	☐	☐
10. comb	☐	☐	24. paper	☐	☐	38. towel	☐	☐
11. fork	☐	☐	25. penny/coin	☐	☐	39. rubbish	☐	☐
12. glass	☐	☐	26. picture	☐	☐	40. vacuum/hoover	☐	☐
13. glasses	☐	☐	27. plant	☐	☐	41. wristwatch	☐	☐
14. hammer	☐	☐	28. plate	☐	☐			

Other item words:

CLOTHING: **(U = UNDERSTANDS, S = SIGNS)**

	U	S		U	S		U	S
1. belt	☐	☐	9. gloves	☐	☐	17. shoe	☐	☐
2. bib	☐	☐	10. hat	☐	☐	18. shorts	☐	☐
3. boot	☐	☐	11. hearing aid	☐	☐	19. snowsuit	☐	☐
4. button	☐	☐	12. necklace	☐	☐	20. sock	☐	☐
5. clothes/dress	☐	☐	13. pyjamas	☐	☐	21. cardigan/jumper	☐	☐
6. coat/jacket	☐	☐	14. trousers	☐	☐	22. tights	☐	☐
7. nappy	☐	☐	15. scarf	☐	☐	23. knickers/pants	☐	☐
8. earring	☐	☐	16. shirt	☐	☐	24. zip	☐	☐

Other clothing words:

PREPOSITIONS AND LOCATIONS: **(U = UNDERSTANDS, S = SIGNS)**

		U	S			U	S			U	S
1.	about	☐	☐	7.	for	☐	☐	13.	over	☐	☐
2.	above	☐	☐	8.	here	☐	☐	14.	to	☐	☐
3.	back	☐	☐	9.	inside/in	☐	☐	15.	under	☐	☐
4.	behind	☐	☐	10.	next-to	☐	☐	16.	up	☐	☐
5.	beside	☐	☐	11.	on	☐	☐	17.	with	☐	☐
6.	down	☐	☐	12.	out	☐	☐				

Other prepositions or locations:

TOYS: **(U = UNDERSTANDS, S = SIGNS)**

		U	S			U	S			U	S
1.	ball	☐	☐	5.	doll	☐	☐	9.	puzzle	☐	☐
2.	balloon	☐	☐	6.	game	☐	☐	10.	robot	☐	☐
3.	bat	☐	☐	7.	pencil	☐	☐	11.	story	☐	☐
4.	book	☐	☐	8.	present	☐	☐	12.	toy	☐	☐

Other toy words:

BODY PARTS: (U = UNDERSTANDS, S = SIGNS)

		U	S			U	S			U	S
1.	arm	☐	☐	10.	finger	☐	☐	19.	cut/hurt	☐	☐
2.	belly button	☐	☐	11.	hair	☐	☐	20.	shoulder	☐	☐
3.	buttocks/bottom	☐	☐	12.	hand	☐	☐	21.	tooth	☐	☐
4.	cheek	☐	☐	13.	head	☐	☐	22.	toe	☐	☐
5.	chin	☐	☐	14.	knee	☐	☐	23.	tongue	☐	☐
6.	ear	☐	☐	15.	leg	☐	☐	24.	tummy	☐	☐
7.	eye	☐	☐	16.	lips	☐	☐				
8.	face	☐	☐	17.	mouth	☐	☐				
9.	feet	☐	☐	18.	nose	☐	☐				

Other words:

PRONOUNS: (U = UNDERSTANDS, S = SIGNS)

		U	S			U	S			U	S
1.	he/she/it	☐	☐	6.	our	☐	☐	11.	we	☐	☐
2.	hers/his	☐	☐	7.	that	☐	☐	12.	you	☐	☐
3.	me	☐	☐	8.	their	☐	☐	13.	your	☐	☐
4.	my/mine	☐	☐	9.	these	☐	☐	14.	yourself	☐	☐
5.	myself	☐	☐	10.	they	☐	☐				

Other pronouns:

FURNITURE AND ROOMS: (U = UNDERSTANDS, S = SIGNS)

		U	S			U	S			U	S
1.	basement	☐	☐	9.	drawer	☐	☐	17.	shower	☐	☐
2.	toilet	☐	☐	10.	dryer	☐	☐	18.	stairs	☐	☐
3.	bath	☐	☐	11.	garage	☐	☐	19.	table	☐	☐
4.	bed	☐	☐	12.	kitchen	☐	☐	20.	TV	☐	☐
5.	bedroom	☐	☐	13.	lounge	☐	☐	21.	washing machine	☐	☐
6.	chair	☐	☐	14.	fridge	☐	☐	22.	window	☐	☐
7.	cupboard	☐	☐	15.	rocking chair	☐	☐				
8.	door	☐	☐	16.	room	☐	☐				

Other words:

OUTSIDE THINGS: (U = UNDERSTANDS, S = SIGNS)

		U	S			U	S			U	S
1.	garden	☐	☐	9.	moon	☐	☐	17.	star	☐	☐
2.	cloud	☐	☐	10.	rain	☐	☐	18.	street	☐	☐
3.	flag	☐	☐	11.	rock	☐	☐	19.	sun	☐	☐
4.	flower	☐	☐	12.	spade	☐	☐	20.	swing	☐	☐
5.	grass	☐	☐	13.	slide	☐	☐	21.	tree	☐	☐
6.	hose	☐	☐	14.	snow	☐	☐	22.	water	☐	☐
7.	ladder	☐	☐	15.	snowman	☐	☐	23.	wind	☐	☐
8.	lawn mower	☐	☐	16.	hose	☐	☐				

Other words:

WORDS ABOUT TIME: (U = UNDERSTANDS, S = SIGNS)

		U	S			U	S			U	S
1.	after	☐	☐	6.	morning	☐	☐	11.	tomorrow	☐	☐
2.	before	☐	☐	7.	night	☐	☐	12.	tonight	☐	☐
3.	day	☐	☐	8.	now	☐	☐	13.	up-to-now	☐	☐
4.	later	☐	☐	9.	time	☐	☐	14.	yesterday	☐	☐
5.	not yet	☐	☐	10.	today	☐	☐				

Other words:

PLACES TO GO: (U = UNDERSTANDS, S = SIGNS)

		U	S			U	S			U	S
1.	beach	☐	☐	8.	petrol garage	☐	☐	15.	playground	☐	☐
2.	camping	☐	☐	9.	home	☐	☐	16.	school	☐	☐
3.	church	☐	☐	10.	house	☐	☐	17.	shop	☐	☐
4.	circus	☐	☐	11.	film/movie	☐	☐	18.	town	☐	☐
5.	country	☐	☐	12.	outside	☐	☐	19.	work	☐	☐
6.	farm	☐	☐	13.	party	☐	☐	20.	zoo	☐	☐
7.	forest/woods	☐	☐	14.	picnic	☐	☐				

Other words:

VEHICLES: (U = UNDERSTANDS, S = SIGNS)

		U	S			U	S			U	S
1.	aeroplane	☐	☐	5.	car	☐	☐	9.	sledge	☐	☐
2.	bicycle	☐	☐	6.	fire engine	☐	☐	10.	train	☐	☐
3.	boat	☐	☐	7.	helicopter	☐	☐	11.	lorry	☐	☐
4.	bus	☐	☐	8.	motorcycle	☐	☐				

Other vehicle words:

GAMES AND ROUTINES: (U = UNDERSTANDS, S = SIGNS)

		U	S			U	S			U	S
1.	bath	☐	☐	8.	go potty	☐	☐	15.	shh/shush	☐	☐
2.	breakfast	☐	☐	9.	lunch	☐	☐	16.	shopping	☐	☐
3.	bye	☐	☐	10.	nap	☐	☐	17.	sorry	☐	☐
4.	hello	☐	☐	11.	no	☐	☐	18.	thank you	☐	☐
5.	dinner	☐	☐	12.	wee	☐	☐	19.	wake up	☐	☐
6.	poo	☐	☐	13.	peekaboo	☐	☐	20.	yes	☐	☐
7.	catch	☐	☐	14.	please	☐	☐				

Other game/routine words:

HELPING VERBS: (U = UNDERSTANDS, S = SIGNS)

		U	S			U	S			U	S
1.	can	☐	☐	5.	don't like	☐	☐	9.	want	☐	☐
2.	can't	☐	☐	6.	don't want	☐	☐	10.	will	☐	☐
3.	don't care	☐	☐	7.	have to/need/must	☐	☐				
4.	don't know	☐	☐	8.	let me see	☐	☐				

Other words:

QUANTIFIERS: (U = UNDERSTANDS, S = SIGNS)

		U	S			U	S			U	S
1.	all	☐	☐	5.	gone/all gone	☐	☐	9.	other	☐	☐
2.	a lot/much	☐	☐	6.	more	☐	☐	10.	same	☐	☐
3.	any	☐	☐	7.	not	☐	☐	11.	some	☐	☐
4.	each/every	☐	☐	8.	none	☐	☐				

Other quantifiers:

CONNECTING WORDS: (U = UNDERSTANDS, S = SIGNS)

		U	S			U	S			U	S
1.	and	☐	☐	3.	but	☐	☐	5.	so	☐	☐
2.	because	☐	☐	4.	if/suppose	☐	☐	6.	then	☐	☐

Other words:

ACTION WORDS: (U = UNDERSTANDS, S = SIGNS)												
		U	S			U	S			U	S	
1.	away	☐	☐	34.	give	☐	☐	67.	see	☐	☐	
2.	bite	☐	☐	35.	go	☐	☐	68.	search for	☐	☐	
3.	blow	☐	☐	36.	hate	☐	☐	69.	shake	☐	☐	
4.	break	☐	☐	37.	have	☐	☐	70.	share	☐	☐	
5.	bring/carry	☐	☐	38.	hear	☐	☐	71.	show	☐	☐	
6.	build	☐	☐	39.	help	☐	☐	72.	sign	☐	☐	
7.	buy	☐	☐	40.	hide	☐	☐	73.	sit	☐	☐	
8.	catch	☐	☐	41.	hit	☐	☐	74.	skate	☐	☐	
9.	chase	☐	☐	42.	hold	☐	☐	75.	sleep	☐	☐	
10.	chat	☐	☐	43.	hug	☐	☐	76.	slide	☐	☐	
11.	choose	☐	☐	44.	hurry	☐	☐	77.	smile	☐	☐	
12.	clap	☐	☐	45.	imagine	☐	☐	78.	spill	☐	☐	
13.	clean	☐	☐	46.	jump	☐	☐	79.	stand	☐	☐	
14.	climb	☐	☐	47.	kick	☐	☐	80.	stay	☐	☐	
15.	close	☐	☐	48.	kiss	☐	☐	81.	stop	☐	☐	
16.	cook	☐	☐	49.	knock	☐	☐	82.	sweep	☐	☐	
17.	cry	☐	☐	50.	lick	☐	☐	83.	suppose	☐	☐	
18.	cut	☐	☐	51.	like	☐	☐	84.	swim	☐	☐	
19.	dance	☐	☐	52.	look	☐	☐	85.	swing	☐	☐	
20.	draw	☐	☐	53.	love	☐	☐	86.	talk	☐	☐	
21.	drink	☐	☐	54.	make	☐	☐	87.	tablet	☐	☐	
22.	drive	☐	☐	55.	open	☐	☐	88.	taste	☐	☐	
23.	drop	☐	☐	56.	paint	☐	☐	89.	tear	☐	☐	
24.	eat	☐	☐	57.	pick	☐	☐	90.	tell	☐	☐	
25.	enter	☐	☐	58.	play	☐	☐	91.	think	☐	☐	

		U	S			U	S			U	S
26.	fall	☐	☐	59.	pour	☐	☐	92.	throw	☐	☐
27.	feed	☐	☐	60.	pull	☐	☐	93.	touch	☐	☐
28.	find	☐	☐	61.	push	☐	☐	94.	wait	☐	☐
29.	finish	☐	☐	62.	put	☐	☐	95.	walk	☐	☐
30.	fit	☐	☐	63.	read	☐	☐	96.	wash	☐	☐
31.	fix	☐	☐	64.	ride in	☐	☐	97.	watch	☐	☐
32.	get/take	☐	☐	65.	run	☐	☐	98.	wish	☐	☐
33.	have injection	☐	☐	66.	say	☐	☐	99.	work	☐	☐

Other action words:

DESCRIPTIVE WORDS: (U = UNDERSTANDS, S = SIGNS)

		U	S			U	S			U	S
1.	bad	☐	☐	19.	happy	☐	☐	37.	quiet	☐	☐
2.	better	☐	☐	20.	hard	☐	☐	38.	red	☐	☐
3.	big	☐	☐	21.	heavy	☐	☐	39.	sad	☐	☐
4.	black	☐	☐	22.	high	☐	☐	40.	scared	☐	☐
5.	blue	☐	☐	23.	hot	☐	☐	41.	sick	☐	☐
6.	brown	☐	☐	24.	hungry	☐	☐	42.	sleepy	☐	☐
7.	careful	☐	☐	25.	hurt	☐	☐	43.	slow	☐	☐
8.	cold	☐	☐	26.	last	☐	☐	44.	soft	☐	☐
9.	cute	☐	☐	27.	little	☐	☐	45.	sticky	☐	☐
10.	dark	☐	☐	28.	long	☐	☐	46.	stuck	☐	☐
11.	dirty	☐	☐	29.	mad/angry	☐	☐	47.	thirsty	☐	☐
12.	empty	☐	☐	30.	new	☐	☐	48.	tired	☐	☐
13.	fast	☐	☐	31.	nice	☐	☐	49.	wet	☐	☐
14.	fine	☐	☐	32.	noisy	☐	☐	50.	white	☐	☐
15.	first	☐	☐	33.	old	☐	☐	51.	windy	☐	☐
16.	full	☐	☐	34.	orange	☐	☐	52.	yellow	☐	☐
17.	good	☐	☐	35.	poor	☐	☐	53.	yucky	☐	☐
18.	green	☐	☐	36.	pretty	☐	☐				

Other descriptive words:

QUESTION WORDS: **(U = UNDERSTANDS, S = SIGNS)**

		U	S			U	S			U	S
1.	do	☐	☐	4.	what	☐	☐	7.	which	☐	☐
2.	how	☐	☐	5.	when	☐	☐	8.	who	☐	☐
3.	"what"	☐	☐	6.	where	☐	☐	9.	why	☐	☐
								10.	how many	☐	☐
								11.	how much	☐	☐

Other words:

Does your baby combine signs to make sentences? **Yes** **No**

If yes, please write down the examples below, e.g. "me-food"

APPENDIX 3

Oxford Communicative Development Index

OXFORD UNIVERSITY BABYLAB

Communicative Development Inventory

- A UK adaptation of the MacArthur CDI * -

Dear parent,

The following is a list of words that are typical in children's vocabularies.

For words that your child **understands but does not yet say**, place a mark in the first column, labelled "**U**".

	U	U/S
crocodile	λ	O

For words that your child **understands and also says,** place a mark in the second column, labelled "**U/S**".

	U	U/S
crocodile	O	λ

If your child uses a different pronunciation of a word (e.g., 'bickie' for biscuit, or 'telly' for television) - mark the word anyway.

Occasionally we list two alternative forms - please **underline** the one your child understands and/or produces.

	U	U/S
pool/pond	O	λ

Please fill in the whole circle exactly as shown above, do not just tick or partly fill the circle.

correct marking - λ incorrect markings - ⊕ or ⊙

This inventory is a comprehensive "catalogue" of words that are used by many different children across a wide age range, so do not worry if your child knows only a few of them at the moment!

If you have any additional comments or information that you think we should consider, please add these at the end of this inventory.

Thank you very much!

* For information and original copies of the MacArthur CDI, please contact the Developmental Psychology Lab, San Diego State University, San Diego, CA 92182, USA.

OXFORD UNIVERSITY BABYLAB

Communicative Development Inventory

Subject code

.....

Your name: .....

Child's name: ..... Male/female: .....

Birth date of child: ...../...../..... Today's date: ...../...../.....

Animal sounds	U	U/S		U	U/S
baa baa	O	O	ouch	O	O
choo choo	O	O	quack	O	O
cockadoodledoo	O	O	uh oh	O	O
grr	O	O	vroom	O	O
meow	O	O	woof	O	O
moo	O	O	yum	O	O

Animals	U	U/S		U	U/S
animal	O	O	horse	O	O
bear	O	O	kitten	O	O
bee	O	O	lamb	O	O
bird	O	O	lion	O	O
bunny / rabbit	O	O	monkey	O	O
butterfly	O	O	mouse	O	O
cat	O	O	owl	O	O
chicken	O	O	penguin	O	O
cow	O	O	pig	O	O
deer	O	O	pony	O	O
dog	O	O	puppy	O	O
donkey	O	O	sheep	O	O
duck	O	O	spider	O	O
elephant	O	O	squirrel	O	O
fish	O	O	tiger	O	O
frog	O	O	turkey	O	O
giraffe	O	O	turtle	O	O
goose	O	O			

Vehicles	U	U/S		U	U/S
aeroplane / plane	O	O	bus	O	O
bicycle / bike	O	O	car	O	O
boat	O	O	fire engine	O	O
lorry / truck	O	O	pushchair/buggy	O	O

motor-bike	O	O	train	O	O
Toys	U	U/S		U	U/S
ball	O	O	doll	O	O
balloon	O	O	pen	O	O
block / brick	O	O	teddy bear	O	O
book	O	O	toy	O	O
bubble	O	O			
Food and Drink	U	U/S		U	U/S
apple	O	O	food	O	O
banana	O	O	ice cream	O	O
biscuit	O	O	jam	O	O
bread	O	O	juice	O	O
butter	O	O	meat	O	O
cake	O	O	milk	O	O
carrot	O	O	orange	O	O
cereal	O	O	pasta / spaghetti	O	O
cheese	O	O	peas	O	O
chicken	O	O	pizza	O	O
chips	O	O	sweets	O	O
coffee	O	O	tea	O	O
drink	O	O	toast	O	O
egg	O	O	water	O	O
fish	O	O			
Body Parts	U	U/S		U	U/S
arm	O	O	hair	O	O
belly button / tummy button	O	O	hand	O	O
cheek	O	O	head	O	O
ear	O	O	knee	O	O
eye	O	O	leg	O	O
face	O	O	nail	O	O
finger	O	O	nose	O	O
foot	O	O	toe	O	O
tongue	O	O	tummy	O	O
tooth	O	O	mouth	O	O
Clothes	U	U/S		U	U/S
bib	O	O	dress	O	O
boot(s)	O	O	glasses / specs	O	O
button	O	O	hat	O	O

coat	O	O	jacket	O	O
Clothes	U	U/S		U	U/S
jeans	O	O	shoe	O	O
jumper / sweater	O	O	shorts	O	O
nappy	O	O	sock	O	O
necklace	O	O	trousers	O	O
pyjamas	O	O	zip	O	O
shirt	O	O			
Furniture and Rooms	U	U/S		U	U/S
bath / bathtub	O	O	living room	O	O
bathroom	O	O	play pen	O	O
bed	O	O	potty	O	O
bedroom	O	O	refrigerator / fridge	O	O
chair	O	O	rocking chair	O	O
cooker / stove / oven	O	O	settee / sofa	O	O
cot	O	O	sink	O	O
door	O	O	stairs	O	O
drawer	O	O	table	O	O
garage	O	O	TV / television	O	O
high chair	O	O	window	O	O
kitchen	O	O			
Outside	U	U/S		U	U/S
beach	O	O	outside	O	O
bucket	O	O	park	O	O
church	O	O	party	O	O
flower	O	O	pool	O	O
garden	O	O	rain	O	O
house	O	O	school	O	O
moon	O	O	shop	O	O
sky	O	O	swing	O	O
slide	O	O	tree	O	O
snow	O	O	wall	O	O
spade	O	O	water	O	O
star	O	O	work	O	O
stone	O	O	zoo	O	O
sun	O	O			
Household items	U	U/S		U	U/S
bin	O	O	bowl	O	O
blanket	O	O	box	O	O

bottle	O	O	broom	O	O
Household items	U	U/S		U	U/S
brush	O	O	paper	O	O
clock	O	O	penny	O	O
comb	O	O	picture	O	O
cup	O	O	pillow	O	O
dish	O	O	plant	O	O
dummy	O	O	plate	O	O
fork	O	O	purse	O	O
glass	O	O	radio	O	O
hammer	O	O	rubbish	O	O
hoover / vacuum	O	O	scissors	O	O
jug	O	O	soap	O	O
key	O	O	spoon	O	O
lamp	O	O	telephone	O	O
light	O	O	toothbrush	O	O
medicine	O	O	towel	O	O
money	O	O	watch	O	O
mug	O	O			
People	U	U/S		U	U/S
aunt	O	O	girl	O	O
baby	O	O	grandma	O	O
boy	O	O	grandpa	O	O
brother	O	O	lady	O	O
child	O	O	man	O	O
daddy	O	O	mummy	O	O
doctor	O	O	nanny	O	O
friend	O	O	people	O	O
person	O	O	teacher	O	O
policeman	O	O	uncle	O	O
sister	O	O			
Games and Routines	U	U/S		U	U/S
bath	O	O	no	O	O
breakfast	O	O	pat-a-cake	O	O
bye bye	O	O	peekaboo	O	O
dinner	O	O	please	O	O
don't	O	O	shh / hush / shush	O	O
hello	O	O	tea	O	O
hi	O	O	thank you	O	O
lunch	O	O	wait	O	O
nap	O	O	want to	O	O

night night	O	O	yes	O	O
Action Words	U	U/S		U	U/S
bite	O	O	know	O	O
blow	O	O	like	O	O
break	O	O	look	O	O
bring	O	O	love	O	O
bump	O	O	make	O	O
call	O	O	open	O	O
carry	O	O	play	O	O
catch	O	O	pull	O	O
clean	O	O	push	O	O
cry	O	O	put	O	O
cuddle	O	O	read	O	O
cut	O	O	ride	O	O
dance	O	O	run	O	O
draw	O	O	say	O	O
drink	O	O	scratch	O	O
drive	O	O	see	O	O
drop	O	O	show	O	O
eat	O	O	shut / close	O	O
fall	O	O	sing	O	O
feed	O	O	sleep	O	O
find	O	O	smile	O	O
finish	O	O	splash	O	O
get	O	O	stop	O	O
give	O	O	swim	O	O
go	O	O	swing	O	O
have	O	O	take	O	O
hear	O	O	tell	O	O
help	O	O	throw	O	O
hit	O	O	tickle	O	O
hug	O	O	walk	O	O
hurry	O	O	wash	O	O
jump	O	O	watch	O	O
kick	O	O	wipe	O	O
kiss	O	O	write	O	O
Descriptive Words	U	U/S		U	U/S
all gone	O	O	clean	O	O
asleep	O	O	cold	O	O
bad	O	O	dark	O	O
big	O	O	dirty	O	O
blue	O	O	dry	O	O
broken	O	O	empty	O	O

careful	O	O	fast	O	O
Descriptive Words	U	U/S		U	U/S
fine	O	O	old	O	O
gentle	O	O	pretty	O	O
good	O	O	red	O	O
green	O	O	sad	O	O
happy	O	O	scared	O	O
hard	O	O	sick	O	O
hot	O	O	sleepy	O	O
hungry	O	O	soft	O	O
hurt	O	O	thirsty	O	O
little	O	O	tired	O	O
nasty	O	O	wet	O	O
naughty	O	O	yellow	O	O
nice	O	O			
Question words	U	U/S		U	U/S
how	O	O	where	O	O
what	O	O	who	O	O
when	O	O	why	O	O
Time	U	U/S		U	U/S
day	O	O	now	O	O
later	O	O	today	O	O
morning	O	O	tomorrow	O	O
night	O	O	tonight	O	O
Pronouns	U	U/S		U	U/S
her	O	O	my	O	O
his	O	O	that	O	O
I	O	O	this	O	O
it	O	O	you	O	O
me	O	O	your	O	O
mine	O	O			
Prepositions	U	U/S		U	U/S
away	O	O	on	O	O
back	O	O	out	O	O
down	O	O	there	O	O
in	O	O	under	O	O
inside	O	O	up	O	O

off	O	O			
Quantifiers	U	U/S		U	U/S
all	O	O	not	O	O
again	O	O	other	O	O
another	O	O	same	O	O
more	O	O	some	O	O
none	O	O			
Extra words	U	U/S		U	U/S
chase (action)	O	O		O	O
smell (action)	O	O		O	O
	O	O		O	O
	O	O		O	O
	O	O		O	O
	O	O		O	O

Additional Questions:

Does anyone speak to your child in a language other than English (if so, which language)?

Has your child ever had any hearing problems, including glue ear?

Was your child born more than six weeks premature?

Thank you for your help.
If you have any further comments, please write them below.

APPENDIX 4

Total research sample figures for this study

Language	Hearing Status	Age range	No of children	No of data sets
BSL	Deaf	8;0 – 37;99	31	123
BSL	Hearing	8;0 – 37;99	33	153
English	Hearing	8;0 – 28;99	548	548

Table 2.6: Research sample for whole project

APPENDIX 5

Overall difference in all areas of analysis between all three groups.

Colour Key:

Pink: Significant figures

Blue: Deaf children learning BSL

Green: Hearing children learning BSL.

Yellow: Children learning English

Group	Number of Data Sets	Mean number of words	Std. Deviation	ANOVA: Between group sig.	Group Comparison	Overall Sig.
Deaf	100	53.10	67.30	0.064	Deaf vs. CODA	0.053
CODA	117	78.38	74.61		Deaf vs. Hearing	0.163
Hearing	548	68.92	83.00		CODA vs. Hearing	0.476

Table 3.1: Table for overall number of words produced by Deaf, CODA and Hearing groups

Group	Number of Data Sets	Mean number of words	Std. Deviation	ANOVA: Between group sig.	Group Comparison	Overall Sig.
Deaf	100	62.90	68.90	0.000	Deaf vs. CODA	0.000
CODA	117	109.10	85.50		Deaf vs. Hearing	0.000
Hearing	548	139.80	76.14		CODA vs. Hearing	0.001

Table 3.2: Table for overall Total comprehension for Deaf, CODA and Hearing

Group	Number of Data Sets	Mean number of words	Std. Deviation	ANOVA: Between group sig.	Group Comparison	Overall Sig.
Deaf	100	36.30	45.80	0.076	Deaf vs. CODA	0.066
CODA	117	52.20	48.90		Deaf vs. Hearing	0.165
Hearing	548	46.60	53.80		CODA vs. Hearing	0.548

Table 3.3: Table for overall noun production for Deaf, CODA and Hearing children

Group	Number of Data Sets	Mean number of words	Std. Deviation	ANOVA: Between group sig.	Group Comparison	Overall Sig.
Deaf	100	43.50	49.30	0.000	Deaf vs. CODA	0.000
CODA	117	74.70	58.50		Deaf vs. Hearing	0.000
Hearing	548	96.80	51.70		CODA vs. Hearing	0.000

Table 3.4: Table for overall noun comprehension for Deaf, CODA and Hearing groups

Group	Number of Data Sets	Mean number of words	Std. Deviation	ANOVA: Between group sig.	Group Comparison	Overall Sig.
Deaf	100	10.20	15.80	0.122	Deaf vs. CODA	0.103
CODA	117	16.00	18.70		Deaf vs. Hearing	0.449
Hearing	548	13.00	21.70		CODA vs. Hearing	0.320

Table 3.5: Total for overall predicate production for Deaf, CODA and Hearing groups

Group	Number of Data Sets	Mean number of words	Std. Deviation	ANOVA: Between group sig.	Group Comparison	Overall Sig.
Deaf	100	16.30	20.00	0.000	Deaf vs. CODA	0.007
CODA	117	29.50	27.10		Deaf vs. Hearing	0.000
Hearing	548	37.20	26.60		CODA vs. Hearing	0.011

Table 3.6: Table for the overall Predicate comprehension of Deaf, CODA and Hearing groups

APPENDIX 6

Tables 3.7 – 3.12 showing in-depth analysis of groups

Colour Key:

Pink: Significant figures

Blue: Deaf children learning BSL

Green: Hearing children learning BSL.

Yellow: Children learning English

Age interval (months)	Number of Data Sets	Mean Number of words	Std. Deviation	ANOVA: Between group sig.	Groups comparison	Sig.
8-10;99	12	1.33	2.42	0.445	Deaf vs. CODA	0.999
	11	1.36	2.15		Deaf vs. Hearing	0.433
	2	3.50	0.71		CODA vs. Hearing	0.447
11-13;99	18	5.89	7.76	0.011	Deaf vs. CODA	0.364
	15	9.00	14.52		Deaf vs. Hearing	0.329
	57	2.67	3.92		CODA vs. Hearing	0.010
14-16;99	18	25.20	34.92	0.075	Deaf vs. CODA	0.920
	15	28.87	27.65		Deaf vs. Hearing	0.227
	97	14.89	24.26		CODA vs. Hearing	0.139
17-19;99	14	49.71	48.17	0.530	Deaf vs. CODA	0.957
	22	54.59	42.18		Deaf vs. Hearing	0.902
	220	43.67	51.53		CODA vs. Hearing	0.601
20-22;99	13	70.23	64.85	0.019	Deaf vs. CODA	0.726
	21	89.09	52.37		Deaf vs. Hearing	0.031
	35	129.2	80.07		CODA vs. Hearing	0.103
23-25;99	13	116.46	72.13	0.168	Deaf vs. CODA	0.547
	18	146.94	49.26		Deaf vs. Hearing	0.157
	132	159.37	83.63		CODA vs. Hearing	0.810
26-28;99	12	134.16	75.13	0.052	Deaf vs. CODA	0.069
	15	191.33	48.86		Deaf vs. Hearing	0.149
	5	199.40	73.61		CODA vs. Hearing	0.967

Table 3.7: production for all three groups

Colour Key:

Pink: Significant figures

Blue: Deaf children learning BSL

Green: Hearing children learning BSL.

Yellow: Children learning English

Age interval (months)	Number of Data Sets	Mean Number of words	Std. Deviation	ANOVA: Between group sig.	Groups comparison	Sig.
8-10;99	12	2.00	2.21		Deaf vs. CODA	0.309
	11	7.36	11.63	0.001	Deaf vs. Hearing	0.001
	2	30.00	14.14		CODA vs. Hearing	0.006
11-13;99	18	15.44	17.58		Deaf vs. CODA	0.243
	15	32.07	31.97	0.024	Deaf vs. Hearing	0.018
	57	37.60	31.48		CODA vs. Hearing	0.794
14-16;99	18	46.33	54.55		Deaf vs. CODA	0.806
	15	58.13	49.28	0.008	Deaf vs. Hearing	0.015
	97	85.49	54.33		CODA vs. Hearing	0.163
17-19;99	14	66.00	65.51		Deaf vs. CODA	0.501
	22	89.90	60.78	0.000	Deaf vs. Hearing	0.000
	220	149.03	62.27		CODA vs. Hearing	0.000
20-22;99	13	88.30	75.02		Deaf vs. CODA	0.064
	21	141.61	69.64	0.000	Deaf vs. Hearing	0.000
	35	220.29	60.02		CODA vs. Hearing	0.000
23-25;99	13	145.69	74.45		Deaf vs. CODA	0.002
	18	215.55	49.63	0.000	Deaf vs. Hearing	0.000
	132	236.52	52.55		CODA vs. Hearing	0.275
26-28;99	12	145.58	73.49		Deaf vs. CODA	0.000
	15	246.06	52.46	0.000	Deaf vs. Hearing	0.003
	5	262.60	40.18		CODA vs. Hearing	0.856

Table 3.8: Comprehension for all three groups

Colour Key:

Pink: Significant figures

Blue: Deaf children learning BSL

Green: Hearing children learning BSL.

Yellow: Children learning English

Age interval (months)	Number of Data Sets	Mean Number of words	Std. Deviation	ANOVA: Between group sig.	Groups comparison	Sig.
8-10;99	12	0.58	1.44	0.054	Deaf vs. CODA	0.851
	11	0.90	1.57		Deaf vs. Hearing	0.044
	2	3.50	0.70		CODA vs. Hearing	0.081
11-13;99	18	3.50	5.68	0.019	Deaf vs. CODA	0.294
	15	6.53	11.82		Deaf vs. Hearing	0.519
	57	1.78	2.63		CODA vs. Hearing	0.016
14-16;99	18	17.80	27.95	0.138	Deaf vs. CODA	0.953
	15	19.90	19.81		Deaf vs. Hearing	0.358
	97	10.70	18.67		CODA vs. Hearing	0.231
17-19;99	14	35.00	35.69	0.791	Deaf vs. CODA	0.994
	22	36.30	29.01		Deaf vs. Hearing	0.930
	220	31.30	37.03		CODA vs. Hearing	0.818
20-22;99	13	48.30	43.89	0.008	Deaf vs. CODA	0.721
	21	60.90	36.59		Deaf vs. Hearing	0.017
	35	90.80	51.93		CODA vs. Hearing	0.058
23-25;99	13	80.50	44.99	0.245	Deaf vs. CODA	0.533
	18	99.20	32.72		Deaf vs. Hearing	0.220
	132	103.80	49.77		CODA vs. Hearing	0.923
26-28;99	12	89.70	49.88	0.093	Deaf vs. CODA	0.105
	15	122.10	28.53		Deaf vs. Hearing	0.252
	5	124.00	41.77		CODA vs. Hearing	0.995

Table 3.9 noun production for all three groups

Colour Key:

Pink: Significant figures

Blue: Deaf children learning BSL

Green: Hearing children learning BSL.

Yellow: Children learning English

Age interval (months)	Number of Data Sets	Mean Number of words	Std. Deviation	ANOVA: Between group sig.	Groups comparison	Sig.
8-10;99	12	0.75	0.96		Deaf vs. CODA	0.189
	11	4.27	6.18	0.000	Deaf vs. Hearing	0.000
	2	17.5	9.19		CODA vs. Hearing	0.003
11-13;99	18	9.80	13.28		Deaf vs. CODA	0.225
	15	21.70	21.84	0.048	Deaf vs. Hearing	0.038
	57	23.60	21.67		CODA vs. Hearing	0.945
14-16;99	18	30.80	38.9		Deaf vs. CODA	0.762
	15	39.40	34.73	0.007	Deaf vs. Hearing	0.013
	97	56.70	34.44		CODA vs. Hearing	0.181
17-19;99	14	43.70	46.12		Deaf vs. CODA	0.548
	22	57.50	40.13	0.000	Deaf vs. Hearing	0.000
	220	97.10	37.83		CODA vs. Hearing	0.000
20-22;99	13	55.50	49.21		Deaf vs. CODA	0.048
	21	90.70	46.51	0.000	Deaf vs. Hearing	0.000
	35	140.80	34.55		CODA vs. Hearing	0.000
23-25;99	13	91.00	46.93		Deaf vs. CODA	0.000
	18	133.40	28.56	0.000	Deaf vs. Hearing	0.000
	132	144.80	28.14		CODA vs. Hearing	0.285
26-28;99	12	90.83	48.37		Deaf vs. CODA	0.020
	15	147.06	32.21	0.001	Deaf vs. Hearing	0.011
	5	154.4	24.24		CODA vs. Hearing	0.927

Table: 3.10: noun comprehension for all three groups

Colour Key:

Pink: Significant figures

Blue: Deaf children learning BSL

Green: Hearing children learning BSL.

Yellow: Children learning English

Age interval (months)	Number of Data Sets	Mean Number of words	Std. Deviation	ANOVA: Between group sig.	Group comparison	Sig.
8-10;99	12	0.41	0.99	0.823	Deaf vs. CODA	0.928
	11	0.27	0.90		Deaf vs. Hearing	0.829
	2	0.00	0.00		CODA vs. Hearing	0.923
11-13;99	18	0.89	0.40	0.003	Deaf vs. CODA	0.623
	15	0.60	0.21		Deaf vs. Hearing	0.004
	57	0.11	0.05		CODA vs. Hearing	0.140
14-16;99	18	3.11	4.56	0.004	Deaf vs. CODA	0.590
	15	4.47	5.74		Deaf vs. Hearing	0.138
	97	1.16	3.09		CODA vs. Hearing	0.009
17-19;99	14	8.00	9.23	0.176	Deaf vs. CODA	0.949
	22	9.09	8.98		Deaf vs. Hearing	0.597
	220	5.24	10.51		CODA vs. Hearing	0.220
20-22;99	13	13.39	14.89	0.160	Deaf vs. CODA	0.864
	21	16.76	13.70		Deaf vs. Hearing	0.200
	35	23.86	21.96		CODA vs. Hearing	0.356
23-25;99	13	23.46	21.44	0.190	Deaf vs. CODA	0.766
	18	30.00	15.65		Deaf vs. Hearing	0.220
	132	35.96	27.16		CODA vs. Hearing	0.627
26-28;99	12	29.75	19.99	0.061	Deaf vs. CODA	0.077
	15	46.53	16.16		Deaf vs. Hearing	0.171
	5	48.60	25.27		CODA vs. Hearing	0.976

Table 3.11 predicate production for all three groups

Colour Key:

Pink: Significant figures

Blue: Deaf children learning BSL

Green: Hearing children learning BSL.

Yellow: Children learning English

Age interval (months)	Number of Data Sets	Mean Number of words	Std. Deviation	ANOVA: Between group sig.	Groups comparison	Sig.
8-10;99	12	0.41	1.16		Deaf vs. CODA	0.437
	11	1.63	3.17	0.029	Deaf vs. Hearing	0.024
	2	5.50	2.12		CODA vs. Hearing	0.102
11-13;99	18	2.22	3.33		Deaf vs. CODA	0.413
	15	5.53	7.05	0.037	Deaf vs. Hearing	0.029
	57	7.43	8.36		CODA vs. Hearing	0.652
14-16;99	18	8.83	11.92		Deaf vs. CODA	0.894
	15	11.20	10.96	0.050	Deaf vs. Hearing	0.076
	97	17.26	15.94		CODA vs. Hearing	0.314
17-19;99	14	13.43	14.69		Deaf vs. CODA	0.647
	22	19.41	14.96	0.000	Deaf vs. Hearing	0.000
	220	34.4	20.30		CODA vs. Hearing	0.002
20-22;99	13	21.62	18.64		Deaf vs. CODA	0.260
	21	33.05	18.35	0.000	Deaf vs. Hearing	0.000
	35	54.86	22.16		CODA vs. Hearing	0.001
23-25;99	13	38.23	22.23		Deaf vs. CODA	0.026
	18	56.39	18.04	0.000	Deaf vs. Hearing	0.000
	132	63.96	18.81		CODA vs. Hearing	0.255
26-28;99	12	38.08	19.56		Deaf vs. CODA	0.000
	15	70.13	15.15	0.000	Deaf vs. Hearing	0.001
	5	73.00	9.43		CODA vs. Hearing	0.939

Table 3.12: Predicate comprehension for all three groups.

APPENDIX 7

Tables 4.1 – 4-5: Comparison of mean number of words for:

Production & Comprehension

Noun production & comprehension

Predicate production & comprehension

Noun production & Predicate production

Noun comprehension & Predicate comprehension

Colour Key:

Red: Production

Pink: Large difference between the two

Green: Hearing children learning BSL.

Turquoise: Comprehension

Blue: Deaf children learning BSL

Yellow: Children learning English

Age interval (months)	Group	Mean Number of words for total production	Std. Deviation for production	Mean Number of words for total comprehension	Std. Deviation for comprehension	Overall difference
8-10;99	Deaf	1.33	2.42	2.00	2.21	0.67
	CODA	1.36	2.15	7.36	11.63	6.00
	Hearing	3.50	0.71	30.00	14.14	26.50
11-13;99	Deaf	5.89	7.76	15.44	17.58	9.55
	CODA	9.00	14.52	32.07	31.97	23.07
	Hearing	2.67	3.92	37.60	31.48	34.93
14-16;99	Deaf	25.20	34.92	46.33	54.55	21.13
	CODA	28.87	27.65	58.13	49.28	29.26
	Hearing	14.89	24.26	85.49	54.33	70.60
17-19;99	Deaf	49.71	48.17	66.00	65.51	16.29
	CODA	54.59	42.18	89.90	60.78	35.31
	Hearing	43.67	51.53	149.03	62.27	105.36
20-22;99	Deaf	70.23	64.85	88.30	75.02	18.07
	CODA	89.09	52.37	141.61	69.64	52.52
	Hearing	129.2	80.07	220.29	60.02	91.09
23-25;99	Deaf	116.46	72.13	145.69	74.45	29.23
	CODA	146.94	49.26	215.55	49.63	68.61
	Hearing	159.37	83.63	236.52	52.55	77.15
26-28;99	Deaf	134.16	75.13	145.58	73.49	11.42
	CODA	191.33	48.86	246.06	52.46	54.73
	Hearing	199.40	73.61	262.60	40.18	63.20

Fig.4.1: Direct comparison of mean number of words for production and comprehension for all three groups

Colour Key:

Red: Production | Turquoise: Comprehension | Brown: Nouns

Pink: Large difference between the two | Blue: Deaf children learning BSL

Green: Hearing children learning BSL. | Yellow: Children learning English

Age interval (months)	Group	Mean Number of words for noun production	Std. Deviation for noun production	Mean Number of words for noun comprehension	Std. Deviation for comprehension	Overall difference
8-10;99	Deaf	0.58	1.44	0.75	0.96	0.17
	CODA	0.90	1.57	4.27	6.18	3.37
	Hearing	3.50	0.70	17.5	9.19	14.00
11-13;99	Deaf	3.50	5.68	9.80	13.28	6.30
	CODA	6.53	11.82	21.70	21.84	15.17
	Hearing	1.78	2.63	23.60	21.67	21.82
14-16;99	Deaf	17.80	27.95	30.80	38.9	13.00
	CODA	19.90	19.81	39.40	34.73	19.50
	Hearing	10.70	18.67	56.70	34.44	46.00
17-19;99	Deaf	35.00	35.69	43.70	46.12	8.70
	CODA	36.30	29.01	57.50	40.13	21.20
	Hearing	31.30	37.03	97.10	37.83	65.80
20-22;99	Deaf	48.30	43.89	55.50	49.21	7.20
	CODA	60.90	36.59	90.70	46.51	29.80
	Hearing	90.80	51.93	140.80	34.55	50.00
23-25;99	Deaf	80.50	44.99	91.00	46.93	10.50
	CODA	99.20	32.72	133.40	28.56	34.20
	Hearing	103.80	49.77	144.80	28.14	41.00
26-28;99	Deaf	89.70	49.88	90.83	48.37	1.13
	CODA	122.10	28.53	147.06	32.21	24.96
	Hearing	124.00	41.77	154.4	24.24	30.40

Fig. 4.2: Direct comparison for mean number of words for noun production and comprehension

Colour Key:

Red: Production

Turquoise: Comprehension

Orange: Predicate

Pink: Large difference between the two

Blue: Deaf children learning BSL

Green: Hearing children learning BSL.

Yellow: Children learning English

Age interval (months)	Group	Mean Number of words for predicate production	Std. Deviation for production	Mean Number of words for predicate comprehension	Std. Deviation for predicate comprehension	Overall difference
8-10;99	Deaf	0.41	0.99	0.41	1.16	0.00
	CODA	0.27	0.90	1.63	3.17	1.36
	Hearing	0.00	0.00	5.50	2.12	5.50
11-13;99	Deaf	0.89	0.40	2.22	3.33	1.33
	CODA	0.60	0.21	5.53	7.05	4.93
	Hearing	0.11	0.05	7.43	8.36	7.32
14-16;99	Deaf	3.11	4.56	8.83	11.92	5.72
	CODA	4.47	5.74	11.20	10.96	6.73
	Hearing	1.16	3.09	17.26	15.94	16.10
17-19;99	Deaf	8.00	9.23	13.43	14.69	5.43
	CODA	9.09	8.98	19.41	14.96	10.32
	Hearing	5.24	10.51	34.4	20.30	29.16
20-22;99	Deaf	13.39	14.89	21.62	18.64	8.23
	CODA	16.76	13.70	33.05	18.35	16.29
	Hearing	23.86	21.96	54.86	22.16	31.00
23-25;99	Deaf	23.46	21.44	38.23	22.23	14.77
	CODA	30.00	15.65	56.39	18.04	26.39
	Hearing	35.96	27.16	63.96	18.81	28.00
26-28;99	Deaf	29.75	19.99	38.08	19.56	8.33
	CODA	46.53	16.16	70.13	15.15	23.60
	Hearing	48.60	25.27	73.00	9.43	24.40

Fig 4.3: Direct comparison for mean number of words for predicate production and comprehension

Colour Key:

Red: Production

Orange: Predicate

Brown: Nouns

Pink: Large difference between the two

Blue: Deaf children learning BSL

Green: Hearing children learning BSL.

Yellow: Children learning English

Age interval (months)	Group	Mean Number of words for predicate production	Std. Deviation for production	Mean Number of words for noun production	Std. Deviation for production	Overall difference
8-10;99	Deaf	0.41	0.99	0.58	1.44	0.17
	CODA	0.27	0.90	0.90	1.57	0.63
	Hearing	0.00	0.00	3.50	0.70	3.50
11-13;99	Deaf	0.89	0.40	3.50	5.68	2.61
	CODA	0.60	0.21	6.53	11.82	5.93
	Hearing	0.11	0.05	1.78	2.63	1.67
14-16;99	Deaf	3.11	4.56	17.80	27.95	14.69
	CODA	4.47	5.74	19.90	19.81	15.43
	Hearing	1.16	3.09	10.70	18.67	9.54
17-19;99	Deaf	8.00	9.23	35.00	35.69	27.00
	CODA	9.09	8.98	36.30	29.01	27.21
	Hearing	5.24	10.51	31.30	37.03	26.06
20-22;99	Deaf	13.39	14.89	48.30	43.89	34.91
	CODA	16.76	13.70	60.90	36.59	44.14
	Hearing	23.86	21.96	90.80	51.93	66.94
23-25;99	Deaf	23.46	21.44	80.50	44.99	57.04
	CODA	30.00	15.65	99.20	32.72	69.20
	Hearing	35.96	27.16	103.80	49.77	67.84
26-28;99	Deaf	29.75	19.99	89.70	49.88	59.95
	CODA	46.53	16.16	122.10	28.53	75.57
	Hearing	48.60	25.27	124.00	41.77	75.40

Fig. 4.4: Direct comparison for mean number of words for predicate production and noun production.

Colour Key:

Turquoise: Comprehension
Orange: Predicate
Brown: Nouns
Pink: Large difference between the two
Blue: Deaf children learning BSL
Green: Hearing children learning BSL.
Yellow: Children learning English

Age interval (months)	Group	Mean Number of words for predicate comprehension	Std. Deviation for comprehension	Mean Number of words for noun comprehension	Std. Deviation for comprehension	Overall difference
8-10;99	Deaf	0.41	1.16	0.75	0.96	0.34
	CODA	1.63	3.17	4.27	6.18	2.64
	Hearing	5.50	2.12	17.5	9.19	12.00
11-13;99	Deaf	2.22	3.33	9.80	13.28	7.58
	CODA	5.53	7.05	21.70	21.84	16.17
	Hearing	7.43	8.36	23.60	21.67	16.17
14-16;99	Deaf	8.83	11.92	30.80	38.9	21.97
	CODA	11.20	10.96	39.40	34.73	28.20
	Hearing	17.26	15.94	56.70	34.44	39.44
17-19;99	Deaf	13.43	14.69	43.70	46.12	30.27
	CODA	19.41	14.96	57.50	40.13	38.09
	Hearing	34.4	20.30	97.10	37.83	62.70
20-22;99	Deaf	21.62	18.64	55.50	49.21	33.88
	CODA	33.05	18.35	90.70	46.51	57.65
	Hearing	54.86	22.16	140.80	34.55	85.94
23-25;99	Deaf	38.23	22.23	91.00	46.93	52.77
	CODA	56.39	18.04	133.40	28.56	77.01
	Hearing	63.96	18.81	144.80	28.14	80.84
26-28;99	Deaf	38.08	19.56	90.83	48.37	52.75
	CODA	70.13	15.15	147.06	32.21	76.93
	Hearing	73.00	9.43	154.4	24.24	81.40

Fig. 4.5: Direct comparison for mean number of words for predicate comprehension and noun comprehension.

APPENDIX 8

Graphs 4.4- 4.6 detailing trends with previously excluded data sets for children learning BSL for:

Comprehension

Noun comprehension

Predicate comprehension

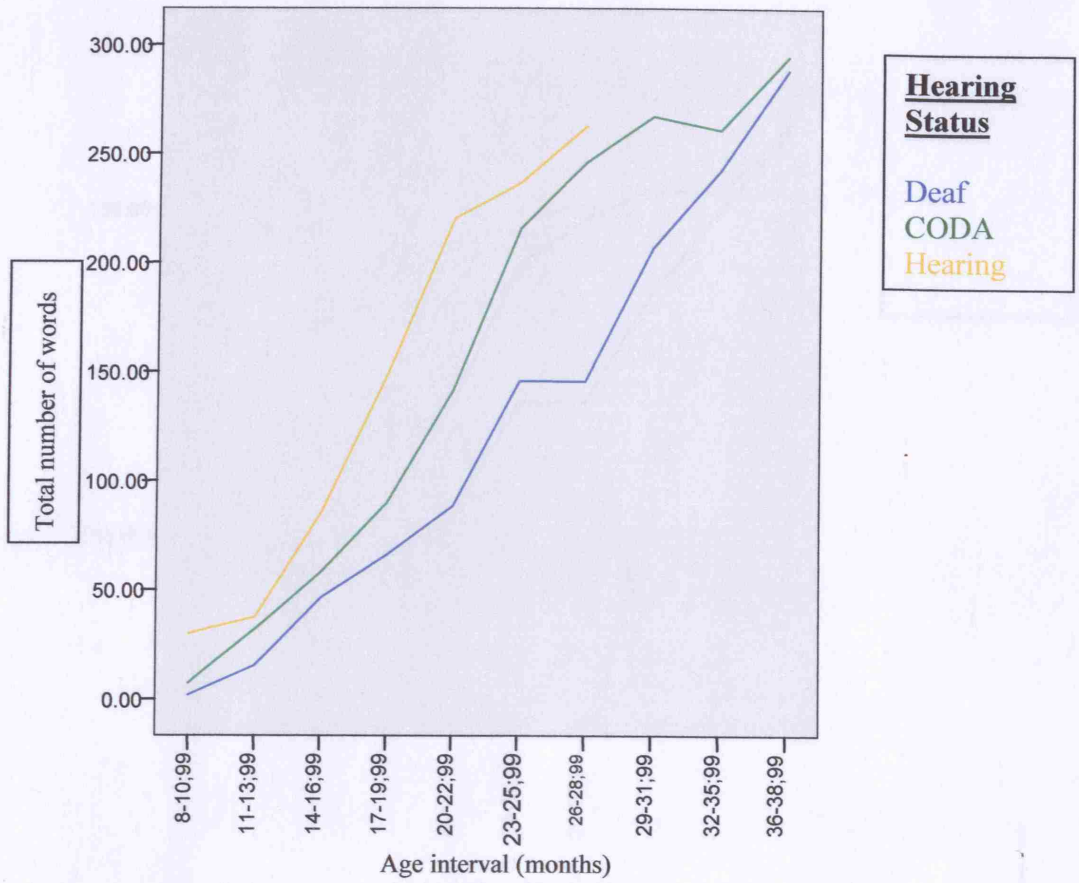


Fig. 4.4: Total comprehension for all three groups

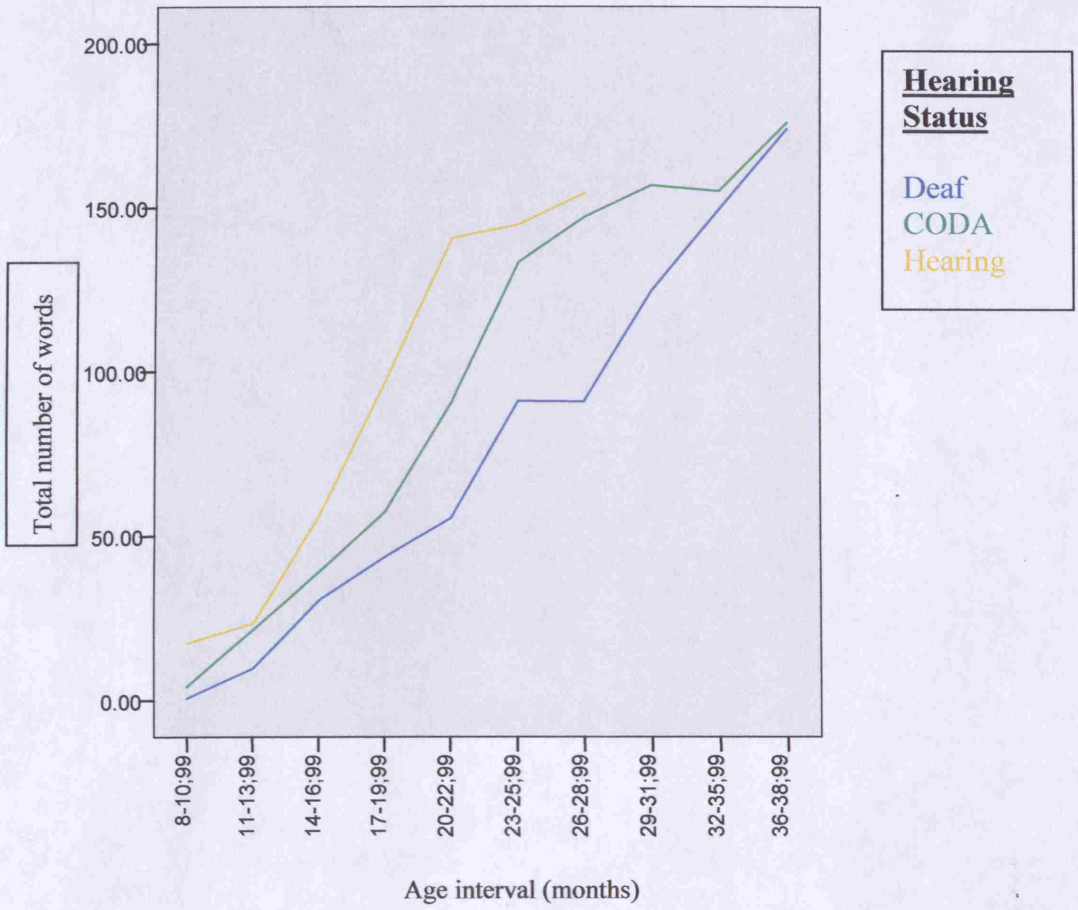


Fig: 4.5: Noun comprehension for all three groups

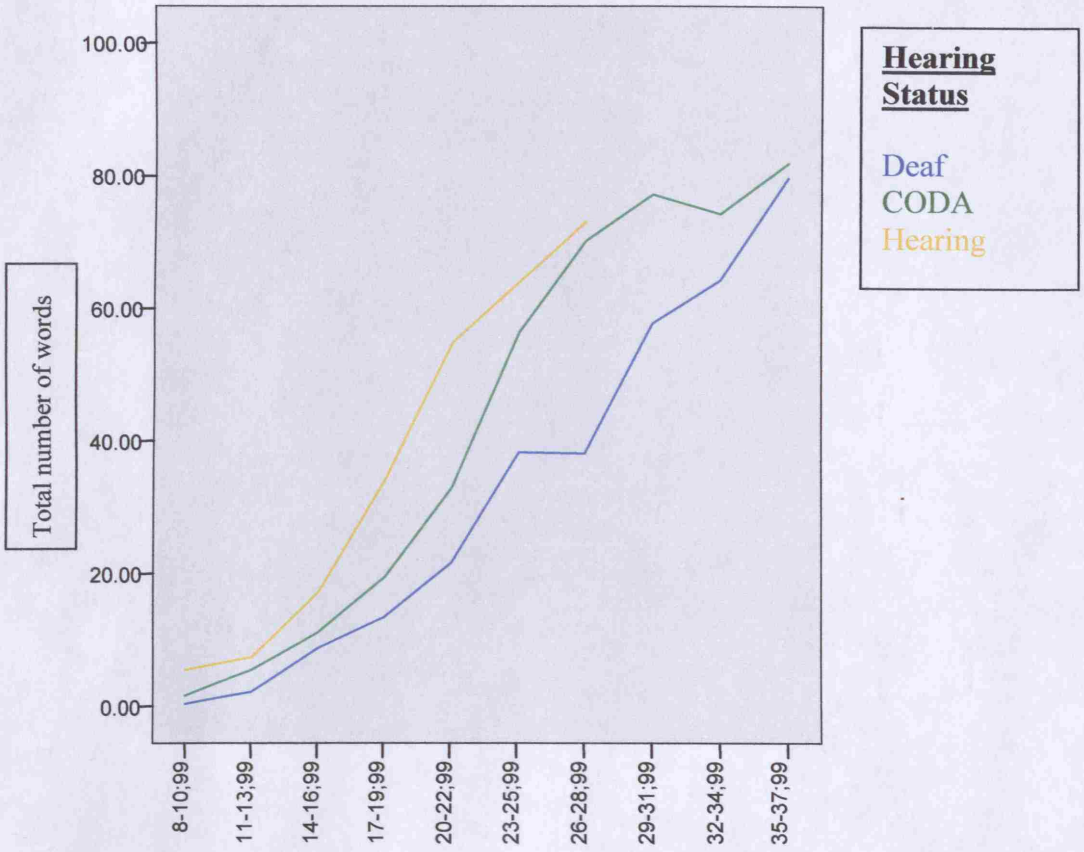


Fig. 4.6: predicate comprehension for all three groups